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The Radio Amateurs' Journal

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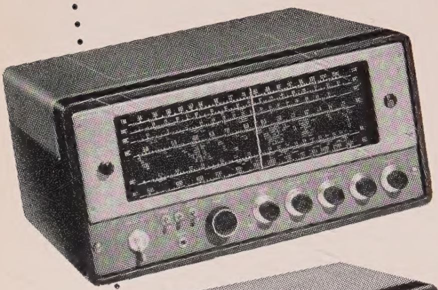

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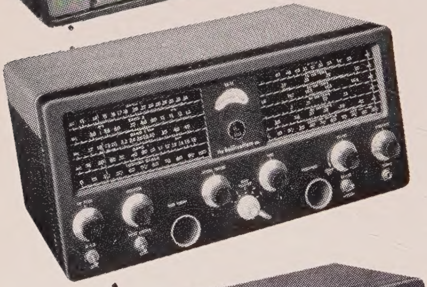

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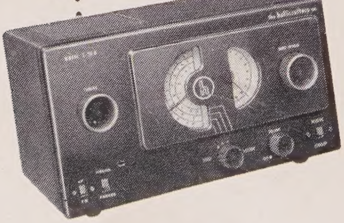

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VOL. 6, NO. 9

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SEPT. 1950

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OUR COVER

With this issue we close the big switch and introduce the *new CQ*. See page 11 for the complete story.

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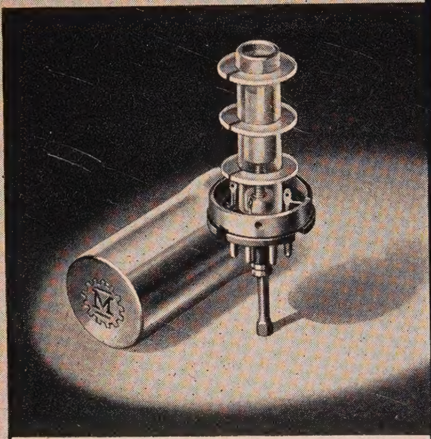
Designed for Application



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Deer Hon. Ed:

Have you ever noticing how one little thing can leading to one little bigger thing, which can leading to one 1/c mess? The one little thing which are starting things off for me are happening a couple of days ago.

Scratchi are scrounging around in the basement looking for old radio of some sort so I can taking out pilot light to replacing in communication receiver which is burned out when I coming across several wooden boxes which have not been opened. I are not knowing what these are, but after opening one and finding that a second wooden crate are inside first one, Scratchi deciding it are some war surplus equipment I buying two years ago.

I are getting slightly excited at this point, gollies, new radio equipment I not knowing I had, so rushing to get crowbar and pliers and hammer, and ripping apart second box. Inside are thick layer of waterproof, fungiproof, airtight covering, which are dulling two blades on knife before able to cutting it apart. Finally, after taking out several cubic feets of dehydrating material, are coming across nice little black box with dials and meters and switches on it.

Two hours and two broken fingernails later are having everything unpacked. In process of sorting things are finding that I seem to have a transmitter of some sort complete with antenna. I carry the stuff upstairs and put it in the shack, and get it connected together, then throw some switches. It seeming to be on the air, but on what frequency?

I listen on receiver, on all bands, and not finding any signals. Next get out wavemeter and search with all the coils, but no luck. Scratchi at this point on stump, so leaving stuff, after turning it off, and go to bed.

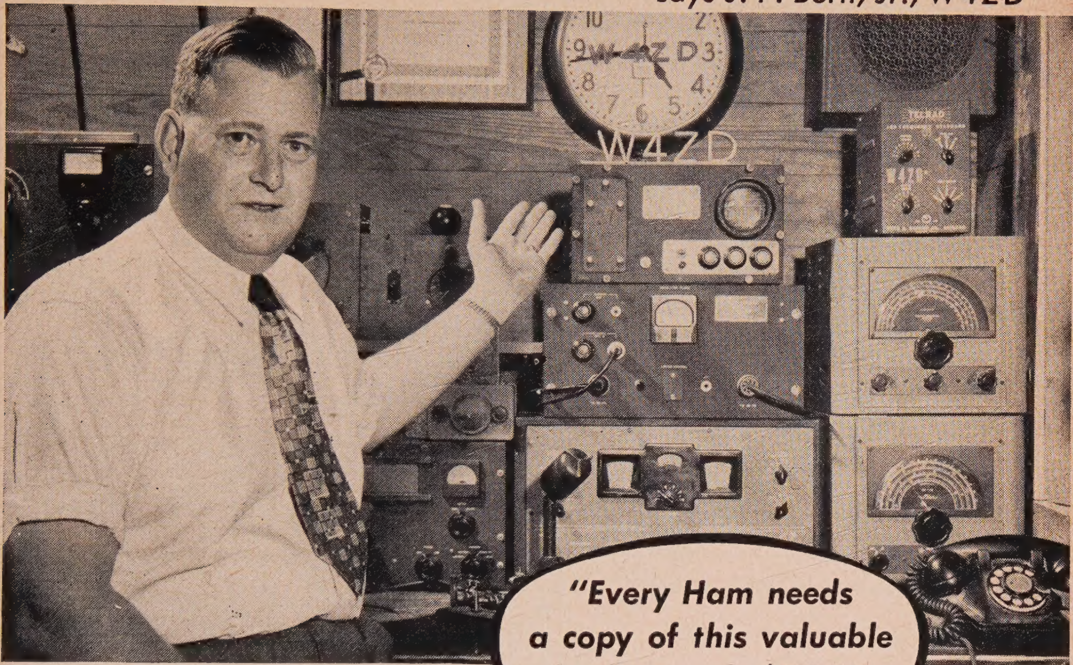
Next morning get up brights and early and again go to shack and turn rig on, meanwhile trying to get idea of how to find out frequency. I dig out old handbook to try to see how to make cavity wavemeter, as supsecting maybe frequency are real high. Scratchi are busy figuring out detales of wavemeter when hearing loud noise of airplanes.

I run to window quick-like and Hokendoke!! two big bombing planes are landing on back o Brother Itchi's ranch. Just as they are settling down three more are circling around and making for landing. I know Brother Itchi are going t have eleventeen fits when he finding out, as cattl all going to running to Mexico if any more airplanes making emergency landing.

(*Continued on page 55*

"I use SYLVANIA 1N56's in my monitoring equipment"

says J. P. Born, Jr., W4ZD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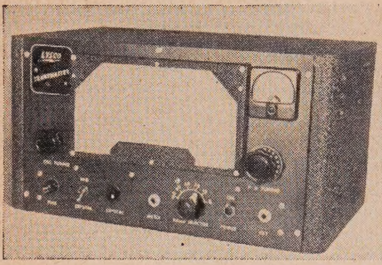

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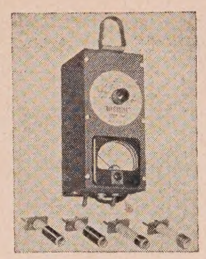

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★ ★ Letters ★ ★

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Editor, CQ:

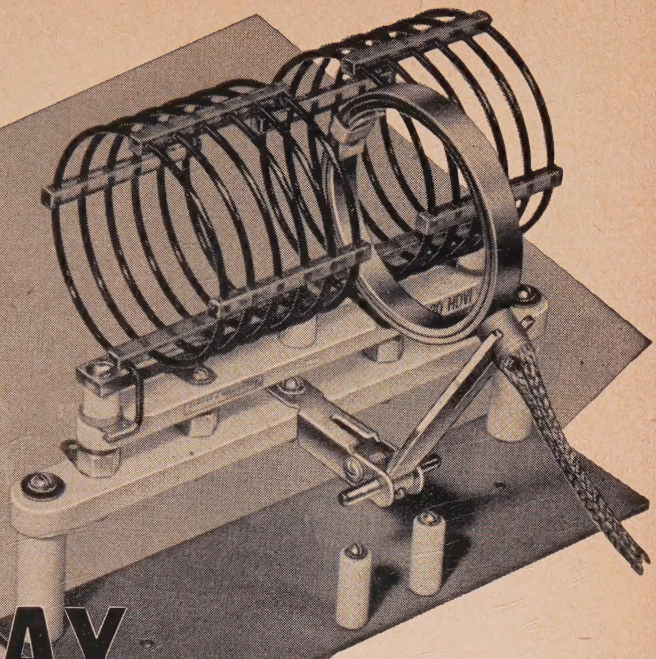
The move to mobile operation, actuated by the urgency for emergency equipment and probably by the desire to experiment with new phases of amateur radio, is well on the way. This is good, because every mobile station can be a first class public relations agent for our hobby if the same care is taken with mobile operation as with home operation.

As I was instrumental in having an amendment to New York State Penal Law, Section 1916, put on the statute books to validate amateur mobile operation in New York, I have been particularly interested in seeing that mobile operators are accorded the rights given under that statute as amended. To facilitate this, I suggest that every mobile operator in New York State carry a printed copy of the law which can be had by contacting me. Beside this it is quite advisable to carry at all times the station license (mandatory by the F.C.C.) and other specific identification such as insurance cards, driver's license, registration license, the names on all of which should tally with the name on the F.C.C. license. A little side advice to be taken as the mobile operator sees fit, but which has worked several times in advantageous manner, is to pay a visit to the police precinct station in which the mobile operator lives or to the police department in the town in which the operator resides and acquaint the "boys" there with the fact that you do possess a mobile rig, that it is being used on emergency drills and for rag chewing etc. In this way should any policeman ever question the right to operate mobile the operator can fall back on the fact that the department already knows him and what he is doing and that it is entirely within the law. In New Jersey, incidentally, it is required that permission be procured from town or county police to install and operate a mobile receiver above broadcast frequencies.

It is my suggestion that some committee be formed in the Metropolitan area, to start with, to promulgate information to the police and press concerning such things as the aforementioned amendment to the New York Statutes, as well as other items which would bring favorable public attention to amateur radio. I have discovered that many police departments are not yet aware of the amateur's rights in regard to mobile operation and this ignorance exists with the general public as to all rights of amateur radio operation, mainly because insufficient publicity has been given to it. There are numerous expert public relations men among the ranks of our hobby who, I am sure, would be only too glad to help correlate good publicity in this area. It is only necessary to have a little progressive leadership to enlist the services of these experts. It is my proposition that this initiative come from, perhaps, the Director of the Hudson Division of the ARRL, or, from one of the major radio clubs in and about the Metropolitan area.

I contend that this subject is equally, if not more important, than TVI and serious consideration should be afforded it. Without proper public relations amateur radio, in such close contact with so many of the public, can never expect to be accorded the respect to which it is due.

Gay E. Milius, Jr. W2NJF



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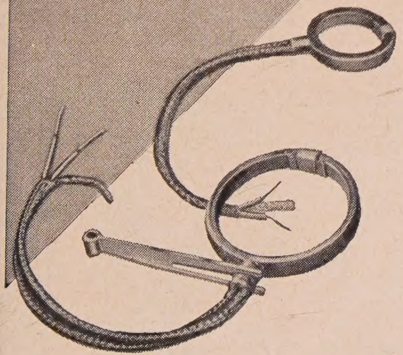

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15	15.0	21.8
10	21.0	30.0

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The Social Side

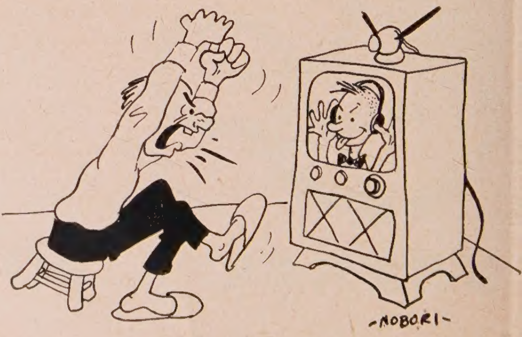
CALIFORNIA—The 1950 Southwestern Division Convention will be held this year at Santa Barbara on September 9th. There will be plenty of technical talks and discussions, mobile rig contests, code speed contests, hidden transmitter hunts, radio parts show, and prizes galore. Some of the biggest personalities in ham radio will be among those present. Convention headquarters will be at the Hotel Mar Monte on East Cabrillo Boulevard, on the waterfront. Registration fees and hotel reservation applications should be mailed to: H. A. Lloyd, P.O. Box 929, Santa Barbara, Cal.

CALIFORNIA—The Mt. Shasta Amateur Radio Club will hold its Fourth Annual Hamfest during the weekend of September 2–4. Many fine prizes will be given, including a S-71 receiver and a Micromatch. There will be prizes for XYLs and Jr. ops. For information and registration write to the Mt. Shasta Amateur Radio Club, Box 805, Mt. Shasta, Calif.

NEW JERSEY—The Hudson Division Convention will take place this year at the Berkeley-Carteret Hotel in Asbury Park on September 30th and October 1st, under the sponsorship of the Garden State Amateur Radio Association. Write P. B. Petersen, W2DME, RFD 1, Box 148, Atlantic Highlands, N. J., for full information.

NEW HAMPSHIRE—The 13th Annual New Hampshire State Convention, sponsored by the Concord Brasspounders, will be held Sunday, September 17th, at the Masonic Temple, Concord. This convention will be attended by amateurs from most of the New England states. For complete information on registration and hotel reservations write Gilman K. Crowell, Chairman, The Concord Brasspounders, P.O. Box 312, Concord, N. H.

IDAHO–MONTANA—The Hellgate Radio Club is sponsoring a hamfest at the southern end of Flathead Lake, Polson, Mont., on September 23rd and 24th. A big feature of the affair will be the banquet to be held on the afternoon of the 24th.



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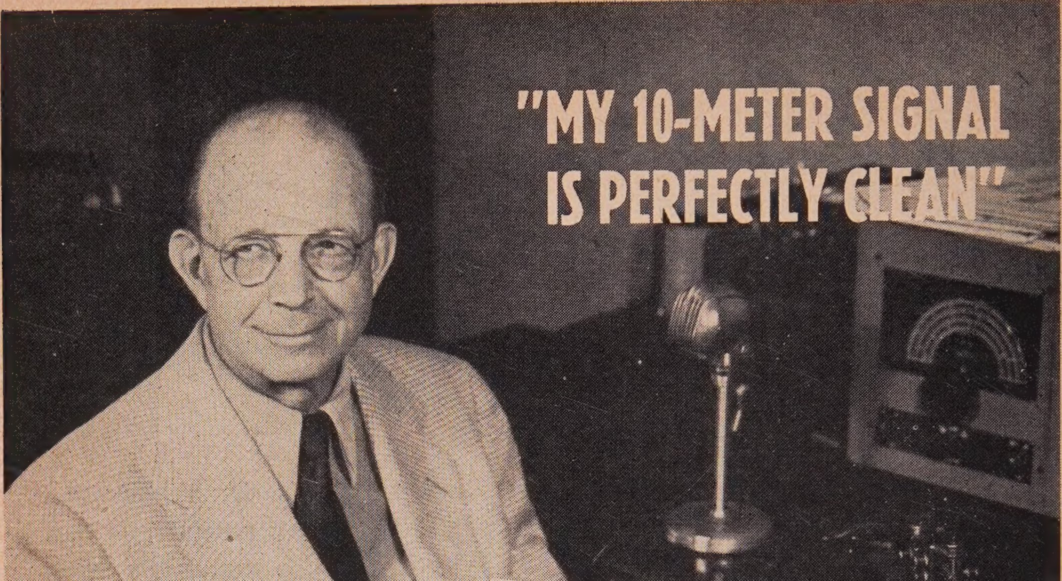

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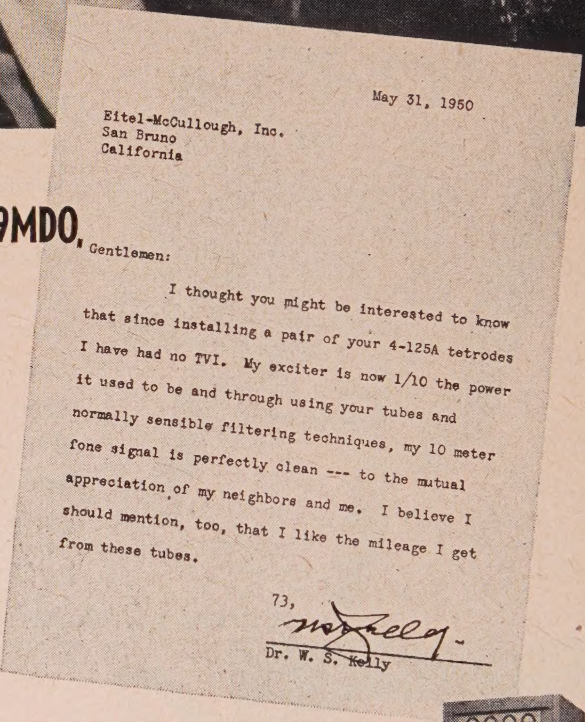

May 31, 1950

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73,

Dr. W. S. Kelly

261

Eimac
TUBES

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ZERO BIAS

EDITORIAL

NO—THE STRONG ARM CLOSING THE BIG SWITCH pictured on our front cover is not that of S. R. (Sandy) Cowan, whose name once again appears on our masthead as Publisher of *CQ*. However, we feel that it is expressive of the new surge of energy that is being put into *CQ*, on behalf of our hobby, effective with this issue. Many *CQ* readers will recall that Mr. Cowan was *CQ*'s original Publisher and co-founder. He brings back to *CQ*'s management over 26 years of radio publishing experience together with the avowed intention of broadening *CQ*'s scope, solely in the best interest of amateur radio.

We emphatically state for the record that the *New CQ* will continue unabated those editorial policies which we have always championed—we'll vigorously support those ideals which we believe will serve the best interest of amateur radio, and, with equal vigor, we'll oppose any ideas or interests which in our opinion would be detrimental to amateur radio.

Our editorial staff is unchanged. The new Publisher has given us the "go-ahead" to expand our efforts toward a greater ham radio. With the support of our readers and our authors we know we're going places.

Civil Defense

With government officials hard at work on Civil Defense planning once again, we feel it is high time or ham radio to ensure that our potentialities are put to greater use than during the years 1941–1945. While the old 2½-meter WERS setup was certainly better than nothing at all, it took far too long to get rolling, and when it finally became a reality it was far too limited, both in its geographical coverage and in the number of licensed hams who were able to participate in it. Our enormous abilities were never called upon by government.

This time we must have both local and long-range facilities, manned by dependable operators, ied in with all Civil Defense groups in every community in the country. No one frequency band can be depended upon to do the whole job, and it's imperative that those responsible for drafting CD plans should realize it. The traditional use of phone for liaison and command circuits and c.w. for record message circuits—the procedure which has stood up o well during the many emergencies which have aken place during the past five years—should point he way to those who, supposedly, have the knowledge to plan for the protection of the civilian public.

It may be that slices of all of our bands can be et aside for use in time of war by amateur stations manned by specially trained and cleared amateurs operating in a manner somewhat akin to that of our present traffic and emergency nets. This is the only way we know of that the civilian population can use the services of the thousands of hams throughout the country who are willing to serve.

Amateur radio operators must be recruited by the armed forces and the State Department to stand regular "watches" on listening-post jobs, sweeping the spectrum continually for unauthorized signals. Sure, the government has plenty of military operators available for such a task, but which would you bet on to read an RST 318 signal, a military op or a ham who won the last DX contest?

It is undoubtedly the easiest way out for the government (national, state, and local) planners to leave the job to the military, as has been done before, but let's do it right this time. It stands to reason that the armed forces can make the best possible use of amateur radio in CD matters only if our CD planners give them the go-ahead.

Are we going to wait, once again, until it is almost too late?

Specialization

Until a couple of months ago we spent most of our on-the-air time on the 3.5-mc band pushing traffic on several of the section and regional traffic nets. We got to know a swell bunch of operators, and were pretty satisfied with the contribution we were making to the broad field of Public Interest, until we began to hear it noised around that W2BYF was never on the air. Running these comments down, we found that their authors were workers on other bands, each of whom considered his special band to be the only phase of ham operation which was worthwhile. "What, you're fooling around on eighty? Why don't you get down on twenty where you can work some DX?" was a typical comment. Or, "Anybody can get out on eighty, it takes a real ham to work two meters." After hearing that sort of thing for a few months we began to get worn down.

We revamped the station so we could flit from band to band with gay abandon, and work traffic, DX, phone, or c.w., as the mood hit us. We've been dividing our operations among the various bands for the past few weeks, and we were beginning to get that "well-rounded" feeling. You can imagine how it jarred us when a W1 whom we hadn't seen for a couple of months said, this morning: "What's up, Doc, TVI got ya? Haven't heard ya on the air in the past couple months."

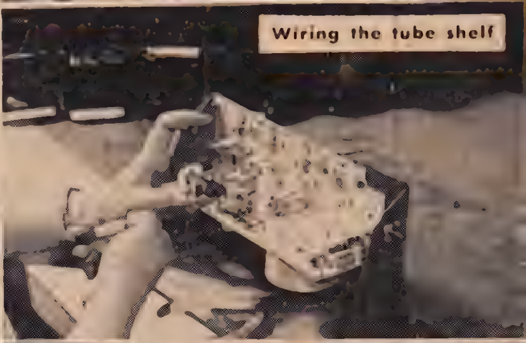
Okay, we'll bite . . . what's the answer?

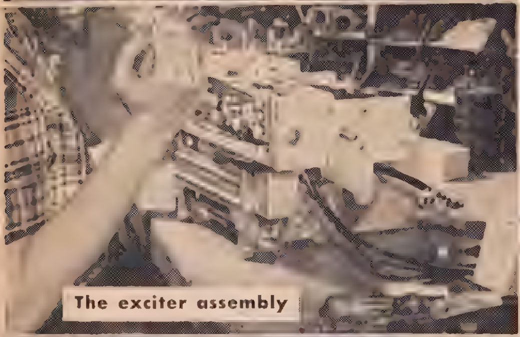
—Doc, W2BYF

The Collins 32V-2 amateur transmitter is designed, assembled, inspected and tested with the same skill and care as the best military radio equipment

Inspection of the audio assembly

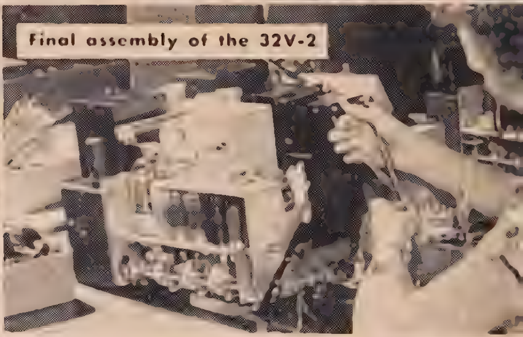
Slide rule and vernier dial unit


Wiring the tube shelf


The exciter assembly

Finishing the output network

Final operation on power supply


Final assembly of the 32V-2

COMING, for the 75A-2 receiver: The 148C-1 NBFM adapter, $22.50, and the 8R-1 crystal calibrator, $25.00 amateur net. Tentative deliveries, November, 1950.

COLLINS

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 W. 42nd Street, NEW YORK 18

2700 W. Olive Avenue, BURBANK

WILFRED M. SCHERER, W2AEF*

BUILDING and using the ANTENNASCOPE

Here is a device we've all been waiting for. The Antennascope can be used to determine antenna resistance and resonance, to match transmission lines for minimum s.w.r., to find receiver input impedance, and for many other r.f. measurements.

In a previous article[1] the writer described an accurate and rapid method of tuning an antenna to resonance, and of matching the transmission line through the employment of a standing wave ratio meter in conjunction with a grid-dipper, or other variable frequency low-power source of r.f. energy.

The s.w.r. meter used was the type embodying the simple resistance bridge. With the instrument connected between an r.f. source and a transmission line having a surge impedance equal to that of the bridge arm, R_1, *Fig. 1,* the meter indicates a null of zero when the line is properly matched at its receiving end, and the indicated s.w.r. is then unity. Although it performed very successfully, its potentialities were not fully realized, mainly due to the fact that R_1 was fixed in value, and which required changing whenever the device was to be used with lines of different impedances. By making this arm continuously variable, the bridge may be used over a wide range of impedances, without the inconvenience of substituting different resistors at R_1.

This modification also not only permits the instrument's normal use in obtaining the minimum s.w.r. with lines of various impedances, but also makes it possible actually to measure the resistive impedance of an antenna, besides checking that of other circuits. Since the operation of the Antennascope, as we now call it, depends upon the ratios of the resistive components R_1, R_2, and R_3, the impedances measured will be resistive in value. Therefore, because the antenna impedance is resistive at resonance, the meter will read zero at a frequency at which the antenna resonates, and when R_1 is equal to the antenna resistance under this condition. A simple method is thereby available both for finding antenna resonance and for measuring antenna impedance or radiation resistance,

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** 100 E. Palisade Ave., Englewood, N. J.*

which is the important factor to be considered when matching a feed line.

A minimum s.w.r. is an accepted requisite for the realization of maximum transfer of power to the antenna, but a point often overlooked, is that antenna resonance must be had *before* the optimum s.w.r. can be attained. Knowledge of the correct radiation resistance is required for determining what impedance line may be used directly without a matching device, or for deciding upon what method of matching may be most suitable for the particular case. This is especially helpful with multi-element beams where the resistance is highly dependent upon exact element spacing, diameter, and length. The resistance of even the ordinary half wave or folded dipole will deviate considerably from their respective center values of 72 and 288 ohms. If an adjustable matching system, such as the T match, is desired, knowledge of the exact antenna resistance is not required, since the matching device may be adjusted in steps until the correct match is found, but when quarter-wave matching transformers, or similar expedients, are to be employed, the resistance must be known. Some antennas may be adjusted to offer a prescribed resistance at the feed point, within certain limitations, while with others a higher impedance point may be located if required.

The impedance range of the Antennascope, described herein, is 10 to 500 ohms. It may be extended to 1000 ohms. The useful frequency range of operation is up to 200 mc. Complete and accurate nulls are obtainable in this range.

The instrument is designed to be used with a grid-dipper as the r.f. generator, since it may be found amongst the equipment of an ever increasing number of amateurs. A v.f.o. controlled source of low power from the transmitter could be used instead, but an advantage of the grid-dipper is that it covers a frequency range wider than that obtainable from the usual amateur transmitter components. Portability of the r.f. source is also of importance so that measurements may be conveniently made at or near the antenna.

Construction

Before proceeding with the methods of application, it might be well to first describe the construction of the unit, so an understanding may be had regarding its principles.

Doubt existed as to the feasibility of making R_1 variable, since it should ideally be a perfect non-reactive resistor in order to permit the unit to function correctly as a resistance bridge, especially at the higher frequencies. Several carbon and composition potentiometers were scrutinized for the nearest approach to this requirement. The Centralab type M 500-ohm miniature composition potentiometer was selected as the best prospect, and tests in the bridge circuit indicated that it is well suited for the application, results being nearly identical to those when employing a fixed non-reactive resistor.

The final circuit for the Antennascope is shown in *Fig. 2*. R_2 and R_3 ½-watt carbon resistors are each 200 ohms, but any value between 50 and 200 ohms may be used as long as they match each other. Higher sensitivity may be realized by using the larger resistors, while the bridge accuracy is slightly better with the lower sizes. The d.c. blocking capacitors, C_1 and C_2 are matched button micas in order to maintain low inductance in these arms, mainly to prevent self resonance in the circuit at high frequencies. The leads are also made short to prevent stray coupling, and the total lead length in each arm is made equal so the inductive reactances will likewise be equal. A small amount of reactance may be tolerated as long as it is identical in each of these arms.

Since the Antennascope is to be used with a very low power source of r.f. energy, high detector sensitivity is necessary for best accuracy. The full scale movement of the null meter should be a maximum of 200 microamperes, and the meter should be one of at least 1000 ohms resistance. The author's unit employs a 150-μa meter. The crystal diode detector is a 1N23A which is more sensitive, for this application, than the customary 1N34.

Mechanical details are shown in *Fig. 4*. For frequencies below 30 mc, no shielding was found necessary, but it is important when the instrument is to be used in the higher frequency region. Leads through the shield partitions are passed through ¼″ holes. No feed-thru bushings are employed, because their capacitance to the shield impairs the accuracy of the unit. The potentiometer and its shaft must be insulated from the case.

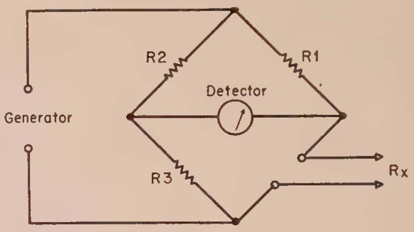


Fig. 1. The fundamental bridge circuit.

Coaxial type connectors were originally installed on the box, but they were unsatisfactory when measuring impedances higher than 100 ohms. The connectors used are the Millen type 33102 crystal sockets. Their capacitance to ground, approximately 4 μμf, just about equals that found across the terminals of R_1, and thus is balanced out. A coaxial receptacle was adapted with pins to plug into the crystal type socket when coaxial lines are to be used.

One side of the bridge circuit is grounded to the case, making it an unbalanced device. Originally it was isolated from the case to obtain balance; however, the layout was very critical. In its present state, little difficulty is experienced in reading balanced circuits as long as certain precautions are observed. These will be mentioned later.

Calibration and Operation

Calibration of the Antennascope is a simple process. First disconnect one of the leads from the variable potentiometer, R_1, and then connect an ohmmeter across its terminals. Mark the impedance scale at the desired points according to the resistance readings obtained with the ohmmeter. The illustrated unit is calibrated at 10-ohm intervals between 10 and 100 ohms, and at 50-ohm intervals between 100 and 500 ohms. If it is desired to read resistances up to 1000 ohms, a 500-ohm ½-watt carbon resistor may be inserted in one leg of the variable arm. Readings will then be 500 ohms plus the value shown on the scale. A 1000-ohm potentiometer may be used instead of this combination, at a sacrifice in accuracy of readings below 100 ohms due to the cramping of the scale in this range. Since most measurements of antennas and transmission lines will lie in the 10- to 500-ohm region, it was deemed better to employ the 500-ohm potentiometer in order to realize greater spread at the low end of the scale. Following calibration, the variable resistor should be reconnected.

The operation of the unit may now be checked. At the input terminals plug in a short twisted lead with a one-turn coupling loop at its end. The diameter of the loop should be such as to fit around the grid-dipper inductor form. Set the grid-dipper at any point in the medium frequency range (15–30 mc). Slide the coupling loop over the inductor until approximately full scale reading is obtained on the Antennascope. Set the latter at 50 ohms. Insert a ½-watt 50-ohm carbon resistor in the output terminals. The meter reading should drop to zero. Then rotate the potentiometer back and forth, and reset according to zero reading. This point should again indicate 50 ohms. The same test should be made with resistors of other values, each time checking the calibration against the value of the test resistor. Repeat checks at several different frequencies up to the specified limit.

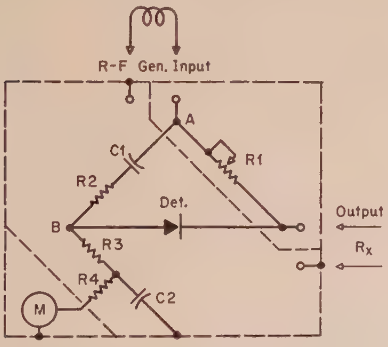


Fig. 2. The circuit of the Antennascope.

C1, C2—500 or 1000 μμf matched button micas
R1—500-ohm pot. (Centralab Type M)
R2, R3—200 ohms, ½ w., carbon. (See text)
R4—1000 ohms, ½ w., carbon
M—Meter, 0-200 d.c. μa or less. (See text)
Det—1N23A Crystal diode

If only partial nulls, other than absolute zero, are found, the instrument is not functioning correctly or the test resistor is reactive. It is imperative that the test resistor itself not only be non-reactive, but that its connecting leads be of an extremely short length to minimize lead inductance. For this reason, the test resistor's leads should be cut short and bent in such a manner as to enable the resistor to be inserted directly into the terminal socket without resorting to any external plug. Once a complete null has been obtained, just lengthen the resistor leads by an inch, and it will be found that the nulls are incomplete. The higher the frequency, the longer the leads, and the higher the resistor, the more noticeable this will be. The very small carbon, and most of the small composition resistors are satisfactory for testing. Connecting resistors in parallel or in series is unsatisfactory. If you think you have a non-reactive dummy load made up of several resistors, just try it on the Antennascope!

Incomplete nulls may also be due to stray coupling or leakage through the internal leads of the instrument, especially between those of the generator input and those of the detector. A slight rearrangement of these leads may be required.

If complete nulls are obtainable, but if the calibration does not agree with the value of the test resistor, internal unbalance of the bridge arms may be the cause. Check the matching of R_2 and R_3. Also, check the match of C_1 and C_2, which may be done with a capacitance bridge or by the grid-dipper method.[2] When high frequencies are involved, the lead inductance in the bridge arms may be unbalanced. This may be rectified by moving the connection of the generator input lead at *A* either towards C_1 or towards R_1, as determined by trial. Likewise the detector lead at *B* may be connected nearer either R_2 or R_3.

Applications

At frequencies above 15 mc, a one-turn coupling loop is usually sufficient for obtaining maximum output from the grid-dipper. For lower frequencies, a two or three turn loop will be required. The position of the loop generally need only be at a point which produces approximately full scale reading on the Antennascope meter, while the impedance dial is set near the expected impedance, and while the output terminals are open. Because the variable potentiometer is linear, nulls towards the high impedance end of the scale will not appear as sharp as those at the lower end. In this case, it may be necessary to increase the coupling to the grid-dipper. For best accuracy of frequency measurements it is advisable to listen to the grid-dipper beat against some standard of frequency while the instruments are set at the measured reading point.

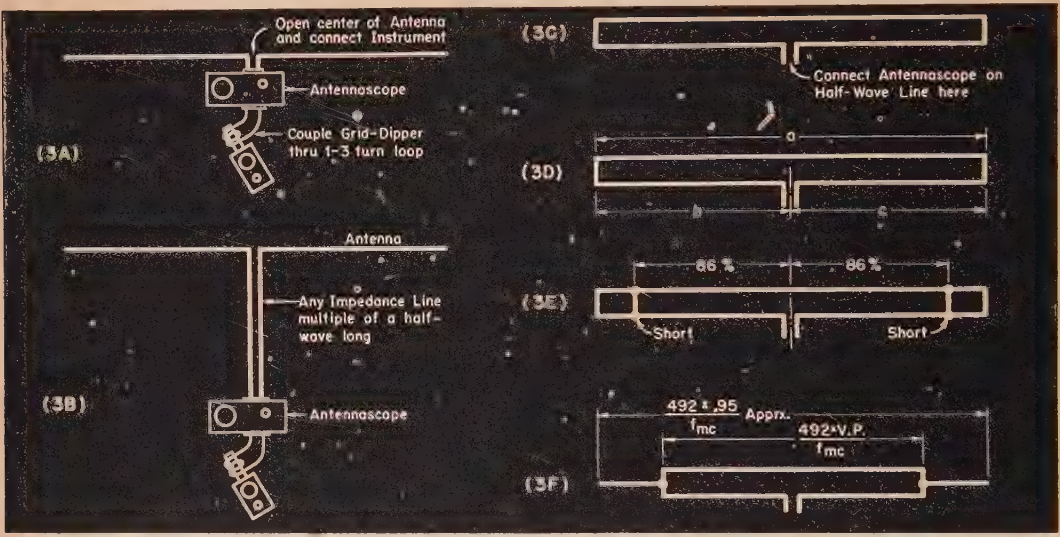
Although the Antennascope has been designed for use with the grid-dipper as the r.f. signal generator, any other low power source may be employed if its output is held to a maximum of ½ watt. In the following discussion the r.f. source will be referred to as the generator. Except otherwise stated, the null is considered as zero meter reading, and it must be kept in mind that this is not obtainable unless the measured impedance is resistive, which, in the case of an antenna or any other circuit made up of inductive and capacitive reactances, means it must be resonant at the frequency concerned. Incomplete nulls indicate the measured impedance is reactive.

Before discussing antenna measurements, data on readings of transmission lines will be first presented, because they clearly indicate special characteristics of these lines, and because certain definite lengths of lines will be used with some measurement procedures.

Quarter-Wave Lines

To determine the electrical length of a quarter wave line, connect the line to the output terminals of the Antennascope. When using twin lead, do not let it lie on the ground, the floor, or metallic objects, but see that it hangs in the clear. The case of the instrument should be ungrounded.

Set the impedance dial at zero, and leave the end of the line open. By varying the generator frequency, find the lowest frequency at which the null occurs. This may be initially approximated by the standard formula $f_{mc} = \frac{246 \times V.P.}{L_{ft}}$. The frequency indicated by the generator is then that at which the line is one-quarter wavelength long, since a quarter-wave open line will appear as a short circuit at its input terminals. Shift the generator frequency to any odd number of times the frequency just found, and the null will again occur, because the above characteristic holds true at odd quarter wavelengths.



Open center of Antenna and connect Instrument
Antennascope
Couple Grid-Dipper thru 1-3 turn loop
(3A)
Antenna
Any Impedance Line multiple of a half-wave long
(3B)
Antennascope
(3C)
Connect Antennascope on Half-Wave Line here
a
(3D)
b
c
86 %
86 %
(3E)
Short
Short
492 × .95 / fmc Appx.
492×V.P. / fmc
(3F)

Now, as of general interest, leaving the generator set at the original frequency, connect a non-reactive resistor equal to twice the line surge impedance at the end of the quarter wave section. Rotate the Antennascope dial until a new null is noted. The generator frequency may have to be slightly retrimmed during this operation. The resistance reading then found will be half that of the line surge impedance, since $Z_s = \frac{Z_o^2}{Z_r}$, where Z_s is the input impedance, Z_o is the line impedance, and Z_r is the load impedance.

Half-Wave Lines

Connect the line to the instrument as above, but this time short the end of the line. With the Antennascope dial set at zero, find the lowest frequency at which the null occurs. This will be the half-wave frequency of the line, since a half-wave line will repeat whatever is connected at its far end, which, in this case, is a short circuit. Any multiple length of a half wave will produce the same results.

Now connect a non-reactive resistor of any value within the range of the Antennascope at the far end of the line. Rotate the dial for the new null, slightly readjusting the generator frequency if required. The indicated value shown on the impedance scale should be that of the test resistor, because, as already shown, a half-wave line will repeat its load.

Transmission Line Surge Impedance

Connect a section of the line, open at its far end, to the Antennascope, and find the frequency at which it is one-quarter wavelength long, as described above. With the generator frequency left set, connect a non-reactive resistor at the far end of the line, and find the new null by rotating the impedance dial. Using this reading, the line impedance may be calculated from $Z_o = \sqrt{Z_s \times Z_r}$. The "inverted" impedance may fall outside the range of the instrument if the test resistor value is too far different from that of the line impedance. A different size test resistor must then be employed. Suggested resistor values when the line impedance is approximately known are 30 or 100 ohms for lines of near 50 to 70 ohms, 50 or 200 ohms for those near 100 ohms, and 200 or 600 ohms for those near 300 ohms.

Antenna Resonance and Resistance

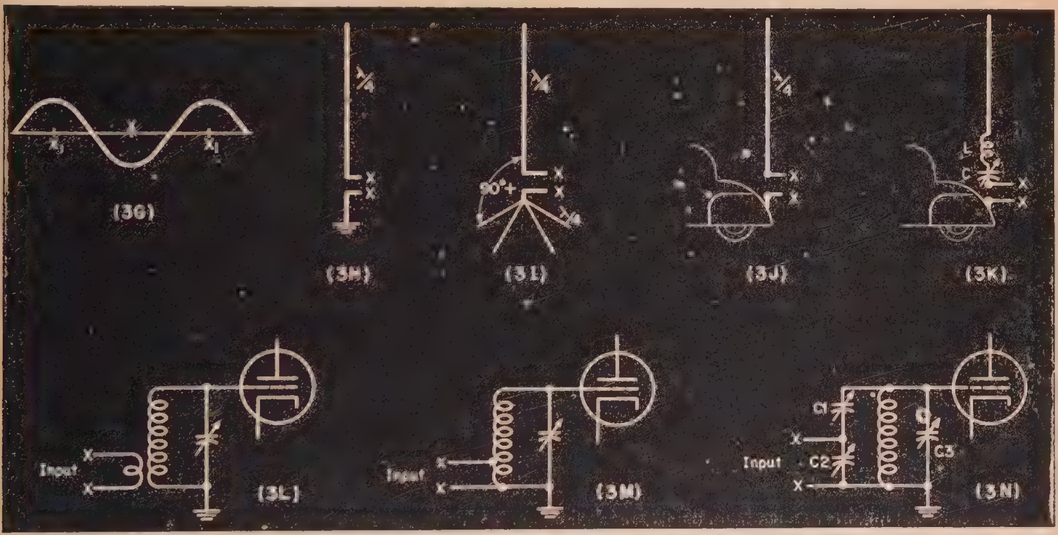
It may seem strange to consider finding antenna resonance by any other means than by the grid dip method when a grid-dipper is already on hand to use with the Antennascope; however, there are cases where a reading by the grid dip method is difficult to obtain, especially when the antenna is of low *Q* or when the element diameter is large. In other situations it may be physically impractical to reach the point at the antenna required for accurate measficient coupling to a long wire or low-frequency antenna, even if it were accessible for measurement.

The Antennascope may be employed directly at the antenna, or at a convenient point removed from the antenna. Resistance and resonance measurements may be made in one operation, because the antenna impedance is resistive at resonance. Occasional reference to the standard antenna formulas will materially aid in correlating readings.

From the following data it will become apparent that the Antennascope may be used in several different ways, either separately or combined, to achieve the same paramount end result of getting the antenna tuned up and the transmission line matched for optimum results. The choice of which procedure to follow is a matter of convenience and will depend upon the problems in each individual case.

Half-Wave Dipole

If the center of the antenna is within reach, when it is in its normal position, the Antennascope may be connected directly at the center, as shown in *Fig. 3A.* The center of the antenna must be opened in order to connect it to the instrument. The leads at this point should be absolutely no longer than necessary to make the connection. Use a twin lead type of plug (Millen #37412). The plug will usually have enough grip to support the device, but if any difficulty is encountered in this respect, the unit may be held in place by heavy cord tied to the antenna. In any event, do *not* support the instrument by holding the case by hand, because this will produce serious unbalance.



The frequency range to employ at the generator may be ascertained by first approximating the antenna frequency according to the standard formula $f_{mc} = \frac{492 \times .95}{\text{length ft}}$. Set the Antennascope dial near 50 ohms, and vary the generator frequency until the best null is indicated. Then rotate the impedance dial until a complete null is realized. The generator frequency may have to be slightly readjusted before the complete null is found. The antenna re-

of the Antennascope, and the antenna resonant frequency will be that at which the generator is now set.

Resistance readings will vary between 10 and 100 ohms, being mainly dependent upon exact height above ground and upon nearby objects or other elements. Tests using the Antennascope to check half-wave antennas at various heights above ground have indicated close adherence to the standard curves of resistance v.s. height[3] when the measurements were made under similar conditions. Do not expect indoor antennas to behave in the normal manner, as their characteristics vary to a surprising extent.

At frequencies above 50 mc the readings are apt to be affected by the presence of the instrument at the center of the antenna and/or the presence of the person making the measurements. Readings will then have to be obtained at a point removed from the immediate proximity of the antenna. This will also be necessary when an antenna is inaccessible for direct readings.

It was demonstrated, earlier, that a half-wave line repeats its load as seen from the sending end. Thus, a half-wave line, or any multiple thereof, may be connected to the center of the antenna, and measurements may be made at the lower end of the line. See *Fig. 3B.* These readings will then be a duplicate of those obtainable directly at the antenna, regardless of line impedance, as long as the line is an exact electrical half wave of the antenna frequency.

Now the question may arise as to how the correct half wave length may be determined in view of the fact that the exact antenna resonant frequency is one of the unknowns to be measured. Although measurements of existing antennas may be desired, it is recommended that the antenna system be tuned or adjusted to prescribed frequency in order to assure peak performance. This will generally be the eventual step anyway, and it will simplify remote readings, because the half-wave line may be first cut to the specified frequency, using the Antennascope method described earlier, following which the antenna may be trimmed to the correct frequency, according to the readings obtained with the instrument at the lower end of the line.

The best procedure for existing antennas is to calculate the antenna frequency approximately, by the standard formula, and then use this as the basis for ascertaining the frequency for the half-wave line. An alternative method is to use a line of an impedance near that of the expected value of the antenna resistance. The mismatch will probably not be too great, and the error will be slight. If the antenna is within reach and if a grid dip measurement is possible, the frequency may be found accordingly. It is obvious that this will apply mainly when the resistance only is to be read, or when the resonant frequency is to be confirmed.

Several precautions must be exercised when making remote measurements. The half-wave line should run at a right angle away from the antenna for a distance of at least a quarter wavelength to minimize unwanted coupling to the antenna. If open wire or twin lead is utilized, twist the line about one turn every two feet. This will tend to cancel out line unbalances to ground which may affect the readings, particularly since the Antennascope is in itself an unbalanced device. The case of the instrument should always be insulated from ground, and it should be placed so as to minimize capacitance between the case and nearby grounded objects. Line unbalances may be checked by reversing the connections at the output terminals. Little change, if any, should be noted in the readings.

With high-frequency antennas it is usually best to employ a line several half waves long to reduce the effect of personal body presence.

If the Antennascope meter should read above zero when the antenna or line is connected to the instrument and when no generator signal has yet been applied, most likely r.f. energy is being picked up from some nearby broadcast station or other high power source. This has been experienced by the writer with several cases involving 3.5-mc antennas. Often just reversing the line has been sufficient to drop the meter reading down to zero. If this does not rectify the situation, about the only other remedy is to wait for the interference to cease. A pair of headphones connected in series with the ground leg of the microammeter will provide a means for identifying the culprit.

Folded Dipoles

Measurements may be made in the same manner as with the normal dipole. See *Fig. 3C*. The Antennascope or the half-wave feed line should be connected to the normally-open section at the center. If any frequency check is made by the grid dip method, the open center must first be shorted. Resistance readings of folded dipoles will generally run between 150 and 350 ohms.

In some cases it may be possible to obtain a second null in the 500-ohm region and at a slightly different frequency. This is due to the following: Referring to *Fig. 3D*, the over all length *a* determines the natural period of the antenna; however, each half of the antenna, sections *b* and *c*, are lines a quarter-wave long at a frequency which may differ slightly from the overall frequency, depending upon height above ground or upon the presence of other elements. With open wire or tubing this is usually not pronounced and is of little consequence, but with a folded dipole made of twin lead, this effect will be quite apparent with a wider frequency difference due to the velocity or propagation factor of the twin lead, the frequency of the quarter-wave section's being about 85% lower than that of the overall natural period. The net result of this situation narrows the frequency *v.s.* impedance response, and the twin lead folded dipole then no longer embodies as broad a characteristic as that of the open wire type. The correct Antennascope reading will be the one found at the higher frequency.

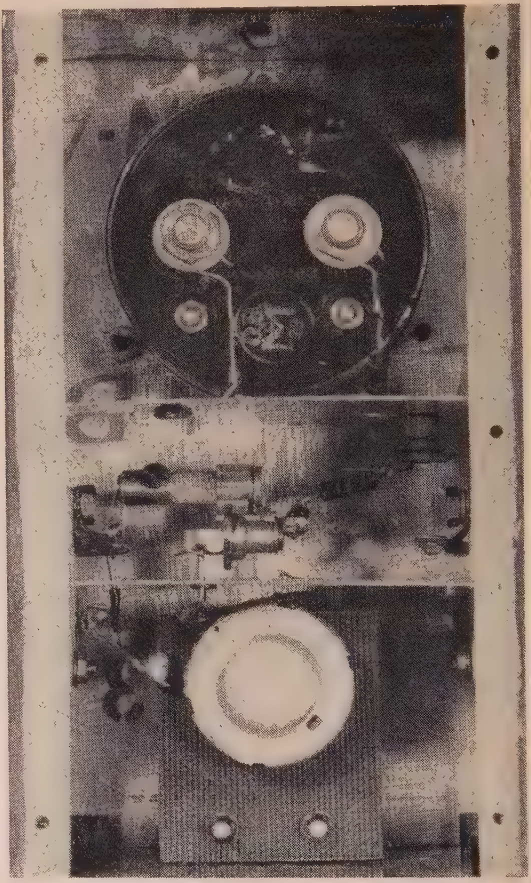
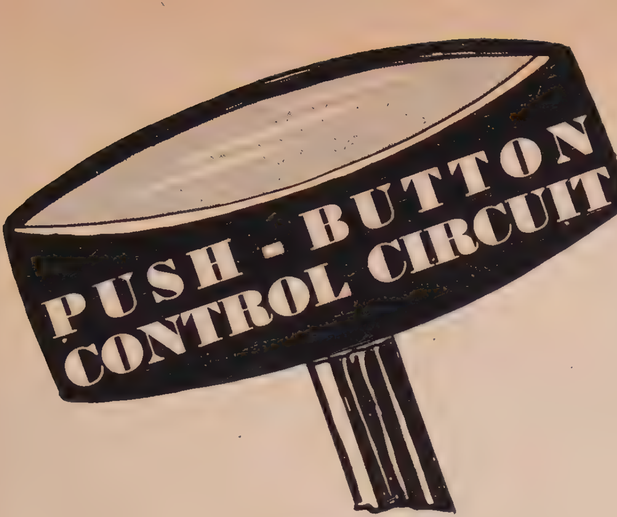


Fig. 4. The interior construction of the Antennascope.

The usually suggested method of altering this situation is that of inserting a fixed capacitor in series with each shorted end. The capacitance is dependent upon frequency, being approximately 7-μμf per meter. An alternative method, which is more practical, is to connect another short across each section at approximately 86% of the distance from the center[4], as shown in *Fig. 3E*. The quarter-wave sections will then be each nearly tuned to the

(Continued on page 59)



PUSH-BUTTON CONTROL CIRCUIT

WILLARD WAITE, W8GDQ*
and
GEO. GNANDT, JR., W8AIK*

A simple control circuit for the ham shack featuring underload and overload protection.

DOES IT TAKE AN OCTOPUS or equivalent to operate breakin at your station? Can your visitors run it without an instruction book? This article describes a simple foolproof push-button control circuit, with complete interlock, overload and underload protection, and which can be operated from several positions in the shack, such as receiver, transmitter, etc. Don't let the number of relays in the diagrams deter you—it's not complicated.

The basic circuit consists of two relays, marked K_1 and K_2 in *Fig. 1.* K_1 the control relay is a 3-pole single throw (make) relay, and K_2 is a s.p.d.t. relay which is used to prevent chattering in the event of overload or underload. Operation is as follows: When power is applied to the circuit by turning on of receiver, transmitter filaments, etc, K_1 is energized through the normally closed contact of K_2. If the interlock circuit is closed, K_1 then locks itself in by means of its contact *A*. At the same time, contacts *B* and *C* of K_1 close. Depressing the start button energizes K_2 and it remains energized as long as the operator's finger is on the button. If an overload should occur during this time, K_1 is deënergized and contacts *A*, *B* & *C* release, *C* cutting off plate relay power and any other auxiliary circuits desired. K_1 cannot again close until the button is released, K_2 then making a connection across K_1A and reëstablishing the control circuit.

If operations are normal when the button is depressed, and no overload then exists, relay K_2 will lock itself in through contact *B* of K_1 and its own contact. If an overload occurs subsequent to this time, K_1 again opens, releasing contacts *A B* & *C*. *B*, of course, releases K_2 which, in turn, recloses K_1 but as *C* does not reclose until after K_2 opens, no plate voltage is applied to the transmitter. It is impossible to get the circuit to pulse or "chatter" as any overload or underload will cause only one cycle of operation for each push of the button. At W8GDQ the controlled circuit consists of a receiver disabling relay, antenna transfer relay, and plate power relay for the transmitter.

Figure 2 shows a Phone-c.w. delay circuit used in conjunction with the above when using surplus 12-volt d.c. relays operated by a selenium rectifier. K_3

(*Continued on page 56*)

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* *Wellington, Ohio.*

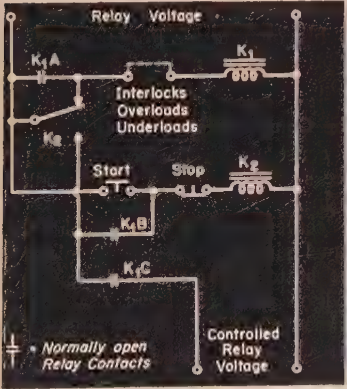

Fig. 1.

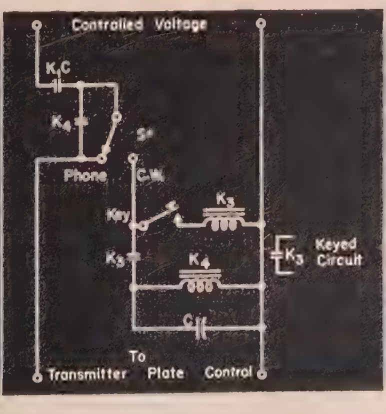

Fig. 2.

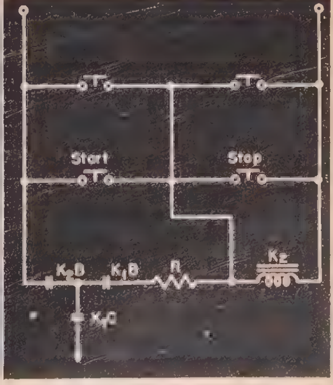

Fig. 3.

A neat and compact operating console can contribute a lot to the efficiency of your station.

HOW TO BUILD AN

CLARENCE A. WEST, W2IYG*

BEFORE, AND SHORTLY AFTER, RECEIVING MY HAM TICKET I was fortunate in seeing quite a number of commercial broadcast station layouts. The operating console always intrigued me, and I planned some day to build something similar for W2IYG. The console shown is the second of its kind which I have constructed. The first model, built before the war, turned out to be entirely too small for all the equipment which was later added with improvements in the station. Practically every ham who has seen either of the consoles has expressed the desire for a similar layout.

Perhaps the most important reason for the construction of a console is for appearance. However, the console provides a means for mounting the various pieces of station equipment used by the operator when the station is on the air. Being partially enclosed, the equipment is protected from dust and dirt. Another advantage is that the wiring is concealed, protected and anchored within the console, thus eliminating the possibility of accidental disconnections. Last, but not least, the console makes possible ease and convenience of operation which adds tremendously to ones operating pleasure.

Since it was desired to operate the station by remote control a convenient operating arrangement was essential. The photo shows, from left to right, the panel with key-type switch for energizing the transformer which supplies relay power. (Keep the key on your key ring and avoid having the "dial twirling" youngsters accidentally put your rig on the air), VFO-exciter, audio amplifier and driver, master-control panel receiver, and Q5er. The master-control panel, center section of console, contains switches and pilots used in controlling the entire transmitter and all receiving, keying, monitoring and audio equipment. The rotary beam switch is also mounted conveniently on this panel. Directly above these controls are two instruments used at present to indicate carrier and audio levels.

To make reading of dials and knobs easy, the individual panels were lighted automobile-dashboard fashion so that lights in the room could be off during operating hours.

The console is built in two main parts, the console proper and the desk. Because the size of the console proper determines the desk size it is preferable first to design the console around the various pieces of equipment to be housed. Don't be afraid to leave a little extra room. It has been my experience that sooner or later additional equipment is added to the station and the extra space is welcome. As will be noted, there are no dimensions shown on the construction drawings except for sizes of various pieces of lumber required. Each builder will no doubt design according to his own taste. For this reason only a brief description of the method of construction follows:

Construction of the Console Proper

To simplify its construction, the console proper is built up in three sections which are later bolted together as shown in *Fig 1.*

Start with the center section which holds the master control panel since this is the simplest to construct. Cut the bottom and the back to shape from ⅞" plywood or pine. Next cut the 1"×2" pieces for the framework. Don't forget the lower front piece with its chamfered upper edge to which the panel is screwed. These parts are fastened together with glue and counter-sunk flat-head wood screws.

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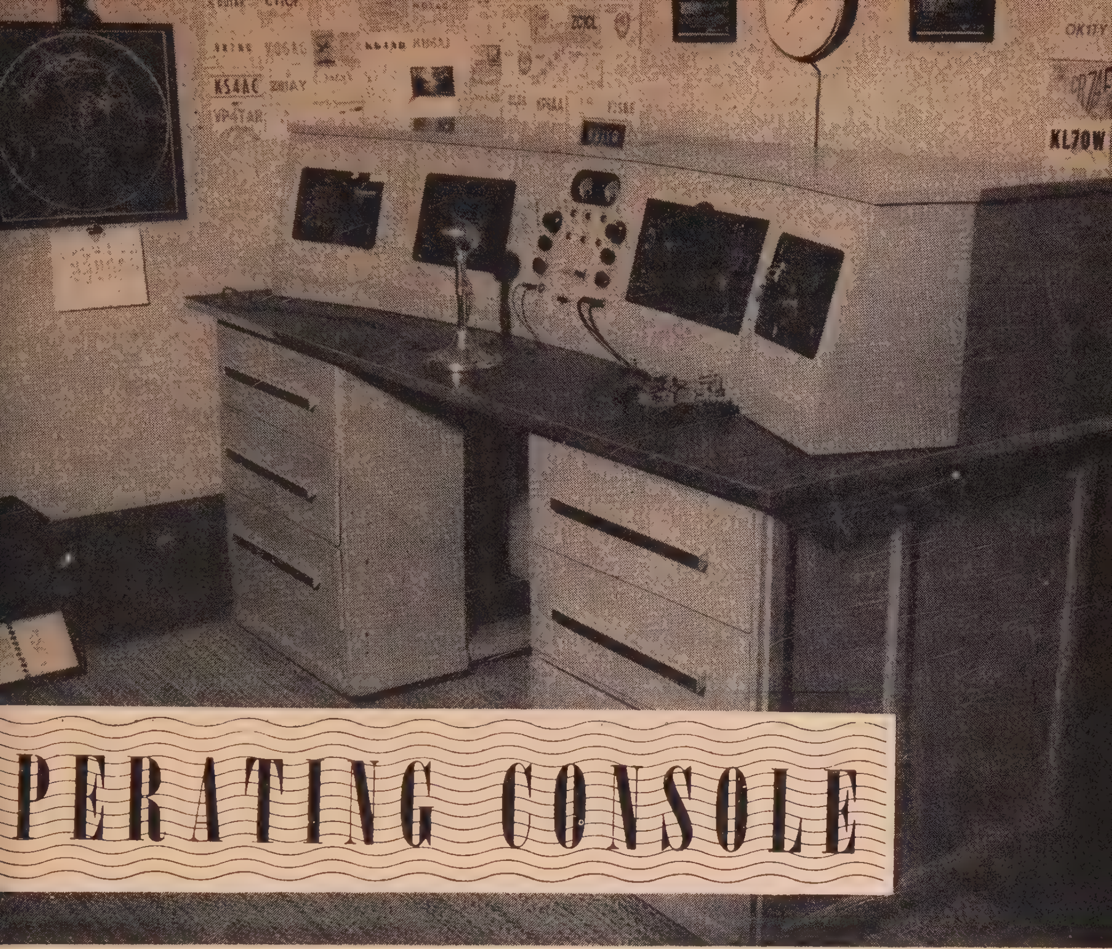
* *343 Chilton St., Elizabeth, N. J.*



PERATING CONSOLE

Either side section may now be tackled and a procedure similar to the one used for construction of the center section employed. In addition, end pieces must be cut to enclose each section. It is best to move from point to point, measuring and cutting pieces as required, to insure good joints and a smooth appearance. The sloping panel and the angular construction of the side sections require some carpentry skill, but if one proceeds on a piece-to-piece basis, construction is relatively simple. As an alternative, one could simply omit the angle between the two portions of each side section and build the fronts straight across (see dotted lines on *Fig. 1*, top view) but leaving the sloping panels. The drawings and photo may suggest even better ideas as the builder plans the construction to suit his personal needs and likes.

Construction of the Desk Section

The desk section of the console is constructed mainly from two unpainted chests of drawers, some 2″×4″ pieces and some ⅞″×18″ pine. The 2″×4″ pieces are used for the framework, while the ⅞″×18″ pieces make up the top and part of the sides. The back is left open to allow for mounting of speaker baffles. If space for magazines or books is desired, some shelves could easily be built into one or both sides of the desk with very little extra work. Incidentally, the transmitter itself can be housed within the desk with controls coming out the sides.

Construction is very simple and can be completed easily on one weekend. Cut to length the four 2″×4″ pieces of the framework marked *D* (see *Fig. 2*). These are inserted along the bottom inner sides of the chest of drawers and screwed into place. Three-inch countersunk flat-head wood screws are used throughout to insure a really solid job. Next cut to length the two 2″×4″ uprights marked *F*. Parts *B*, the two horizontal lengths of 2″×4″ pieces used as top and bottom horizontal support for the rear of the frame, are next cut to size. The front top half section of the desk, *A* is then cut to dimensions and is bolted to the two chests of drawers with four flat-head bolts. The lower rear horizontal 2″×4″ piece is then screwed to the ends of parts *D* and the rear half of both sides of the desk, *G*, (continuation of the chests of drawers) is cut and fastened in place. The upper rear 2″×4″ horizontal piece, *B* is then screwed to the top rear inside corners of the side extensions, *G*, and the two 2″×4″ uprights, *F*, fastened as shown between the horizontal pieces. The rear half of the top, *A*, is then cut and screwed to the top of the framework. For added strength two large metal 90° angle shelf

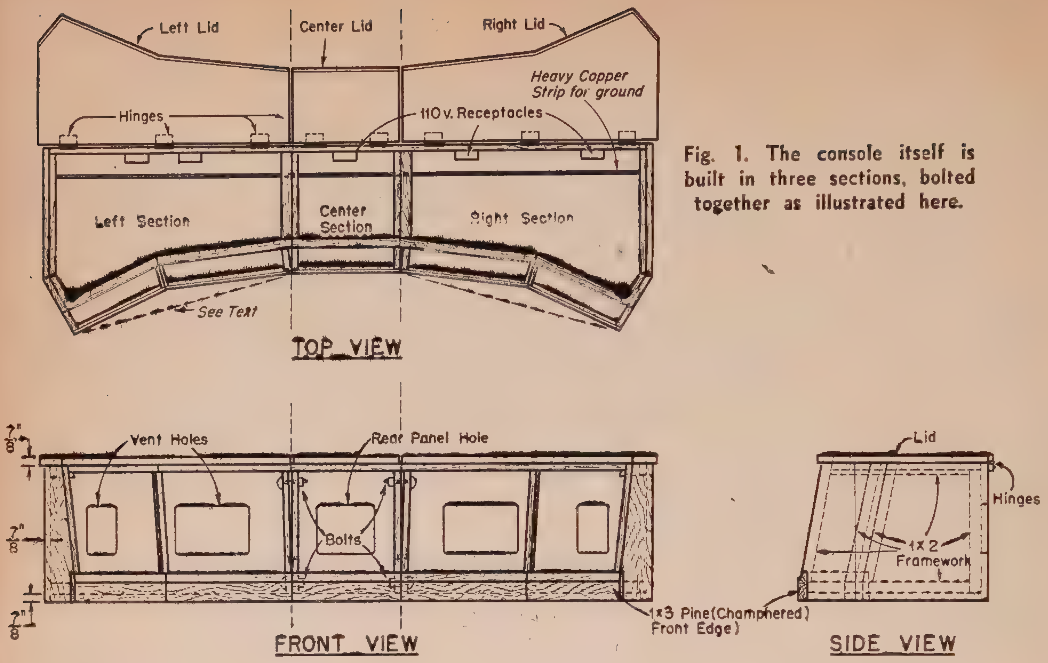


Fig. 1. The console itself is built in three sections, bolted together as illustrated here.

holders are fastened where parts *D* contact lower part *B*. Parts *H* are a pair of 1″×2″ pieces used to reinforce to top of the desk.

To give the desk a finished appearance and to cover screw heads, some molding was nailed to the sides of the desk and along the front lower section. The speaker baffle may be mounted as shown in the photographs.

To provide a neat working surface for the top of the desk a sheet of linoleum was cemented into

(*Continued on page 56*)

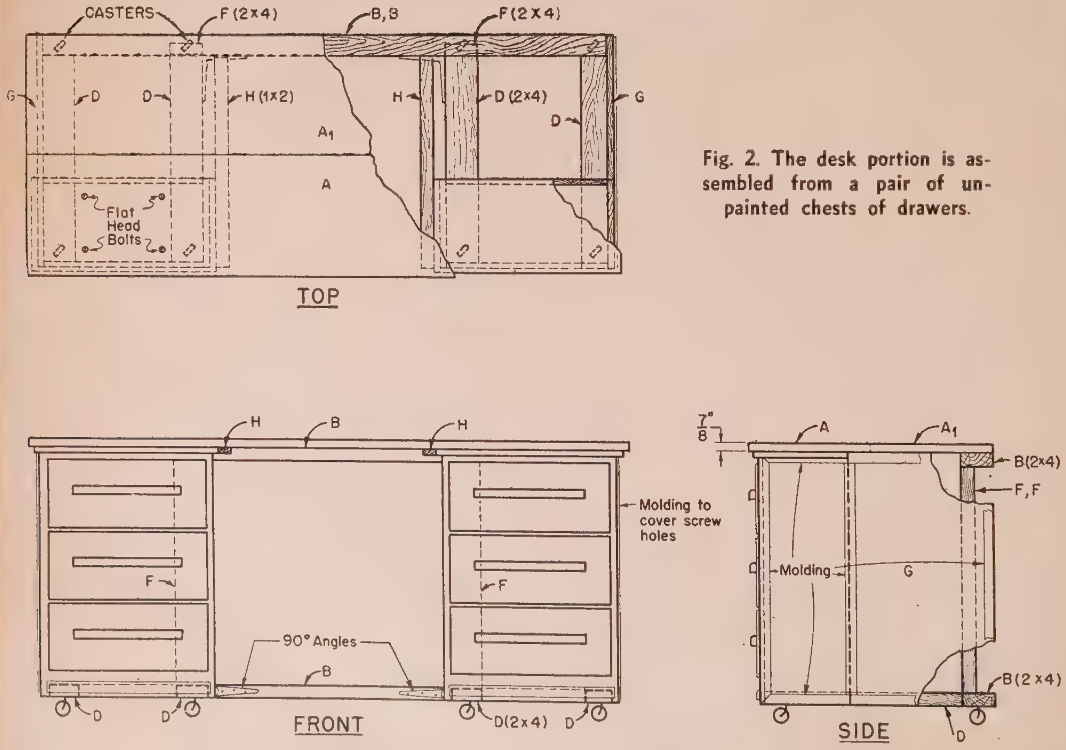
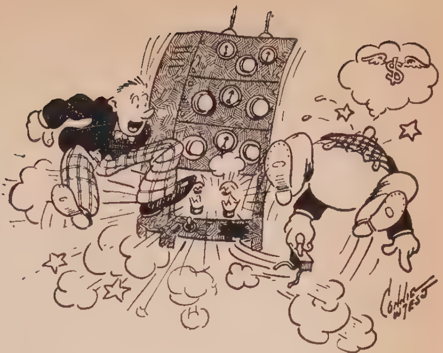


Fig. 2. The desk portion is assembled from a pair of unpainted chests of drawers.

Life is Quite Simple

ROBERT M. RYAN, W7GWA*



"You are a radio amateur, I believe, Is that right?"

"I'm a ham, yes."

"I take it, ham and amateur mean the same thing."

"Dit dah dit."

"What does that mean? That's radio code, isn't it?"

"Roger!"

"Do you always say Roger, when you agree with someone?"

"Not always. Sometimes I say, o.k., or fine business, or . . . . . ."

". . . . . But all of those sayings mean that you concur?"

"Check."

"Is that your transmitter over there on the floor by the table?"

"That's my ham rig."

"Is that what you call it, your ham rig?"

"Not always. I call it my exmitter, or the pile of junk."

"I must say, it certainly has large tubes in it."

"Please! Those are not tubes; they are bottles."

"Are all radio tubes referred to as bottles?"

"Just the big ones. The little ones are tubes."

"What rating system is used in describing the size of a radio tube, or bottle, as the case may be?"

"Bottles are measured in watts. That big one there runs half a gallon."

"You mean, it holds half a gallon?"

"Half gallon is a term meaning 500 mils."

"I take it that you mean milliamperes, when you speak of mils."

"Roger."

"I see. Now, what is that affair on the table there? Isn't that your radio?"

"That's my super-blooper."

"But, don't you listen on it with those earphones?"

"Sometimes I give a listen with the cans, yes."

"Now, tell me, just what is the purpose of this radio broadcasting station of yours?"

"I ham with it."

"You mean, you talk with other amateur radio operators?"

"I have Qew-soes with other hams, yes."

"Do you always Qew-soe when you talk?"

"Sometimes, I give them a buzz, or I give them a shout, or I work them."

"Where are these stations that you talk to?"

"Some of them are W's, and some of them are DX."

"What do you mean by DX?"

"That means they're not locals. They have DX calls."

"It must be difficult to talk to amateurs who are in foreign countries. How do you overcome the language barrier?"

"I give them a shout with the Q-code."

"A sort of international language, eh?"

"Roger."

"You know, ever since I entered your radio room . . ."

". . . . you mean, radio shack."

"Since I've been in here I've been curious as to the significance of those wires that stick through the wall up there."

"That's part of the sky hook."

"Oh, I thought those wires were your aerial."

"They're feeders. Zeep feeders. A 600-ohm line to suck up r-f."

"What are you doing there now?"

"I'm going to give a listen across the dial."

"Do you always listen across the dial?"

"Sometimes, I flip across the band."

"Why did you throw that switch on the transmitter?"

"I just kicked the filaments on."

"But, you turned the switch on with your hand. You didn't kick it at all."

"I always kick on the filaments with my hand."

"Say, that's a loud station you have on the radio there now."

"He's ten DB over nine."

"You mean, you measure the strength of the stations you hear?"

"I've got an S-meter. That's how I give out reports."

"You've got a weak station on there now. I can just barely make out what he's saying. How does he measure on the meter?"

"He's only 6 DB over nine."

"Then your meter doesn't go much below nine, I take it."

"It's a liberal meter."

"What is that weak station saying. He keeps repeating the letters CQ."

(Continued on page 55)

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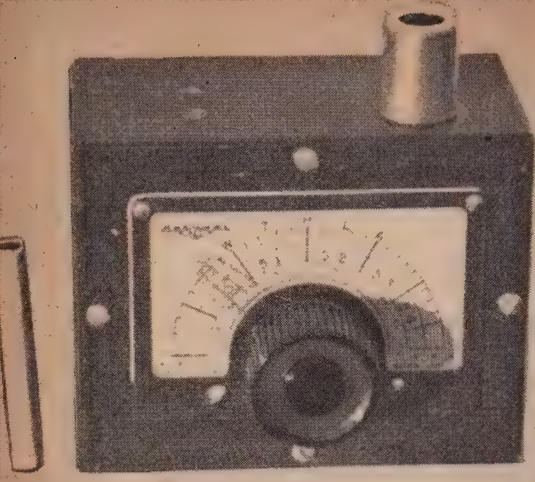
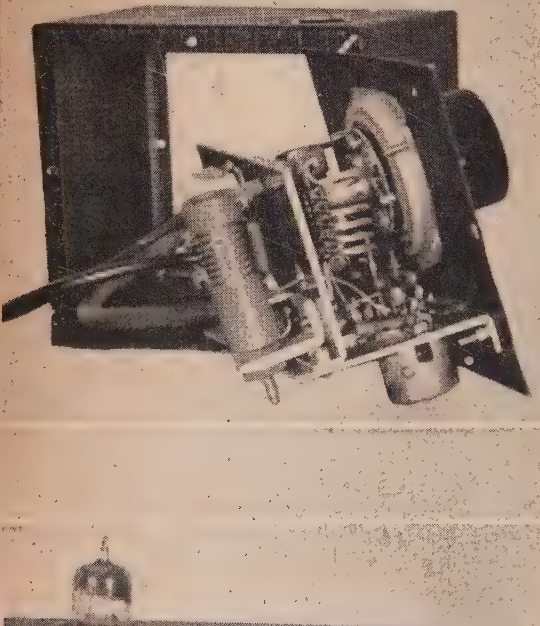
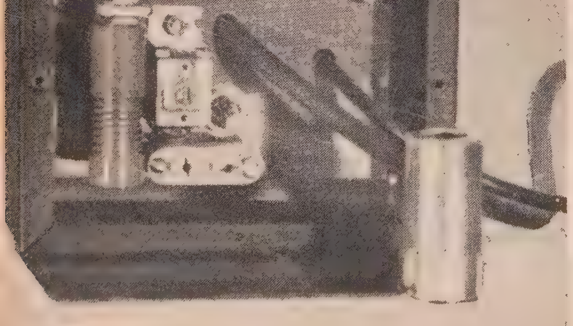
* *11309 Bothell Way, Seattle 55, Wash.*







C. O. BISHOP*

W7HEA

In the past there have been many very excellent articles published on converters but most of them seem a little too complicated for anyone having just a mild interest in listening on the six meter band. The converter described here was built to see just what results could be expected with a simple circuit and a minimum number of components. Only parts on hand were used in the construction and there are no critical components or adjustments necessary.

The circuit is strictly conventional and is built around the 6J6. L_1 is the antenna coil, and the R9er circuit is used to couple in the antenna so that an impedance match may be obtained with any type antenna desired. L_2 is the oscillator coil, and the oscillator is operated on the high side of the signal frequency. Since an i.f. frequency of 5.2 mc is used with the other converters here, the same frequency was chosen for this one. C_1 is the band-set condenser and C_2 the one and only tuning control. Since the frequency coverage of the coil and condenser combination is rather wide, a different i.f. frequency may be used by just changing the adjustment of C_1, the band-set condenser. L_3 is the i.f. coil and the output is taken off thru another R9er combination to allow match to the regular receiver input. L_3 is set at 5.2 mc but considerable frequency coverage is available by varying the slug in the coil.

It was found that the r.f. circuit was fairly broad as it is, so no provisions were made to increase the bandpass. If it is peaked at approximately 50.5 mc there is very little change in signal strength from 50 to 51 mc. Since most of the activity is in the 50 to 51 megacycle portion of the band it was considered adequate as it is. If more bandpass is desired, loading the circuit by placing a 6000-ohm resistor across I_1 will accomplish this but there will be some loss in gain. Since I_1 is tuned by a slug it can also be tuned so that any portion of the band desired may be covered with reasonable efficiency.

The pictures show the parts layout used but as there is nothing critical about this converter any layout suitable to what you have on hand will do very nicely. A 3×4×5 Bud utility box serves as the

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** 207 E. Toppenish Ave., Toppenish, Wash.*

SIMPLICITY ON SIX

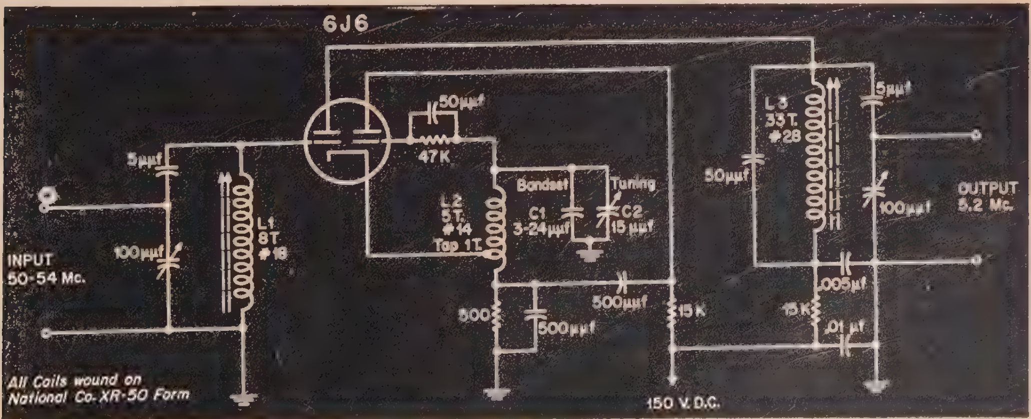
If your communications receiver doesn't cover six, or if you'd like to improve its v.h.f. performance, try this acme of simplicity and see what fun six-meter operation can be.

cabinet and a miniature National dial dresses up the front. The chassis is made from two interstage shields cut to size and bolted together. The bottom view shows the oscillator coil mounted inside the back shield and right over the tube socket. The r.f. coil and its associated parts are on the outside of the shield. The i.f. coil is at the top of the picture. Holes are drilled in the top of the cabinet so that the i.f. coil slug, its R9er condenser, the oscillator band-set condenser C_1, and the r.f. coil slug can be adjusted when the unit is in the cabinet. A Millen crystal socket is used to plug in the antenna connections and it and the R9er condenser are mounted alongside the r.f. coil in back of the shield. A piece of small coax is used to couple the output to the regular receiver and another three conductor cord takes care of the power connections.

All the resistors are one half watt and the fixed condensers are Centralab HyKaps but any others will do just as well. The power requirements are so small that they may be taken care of by almost any other piece of gear available. Greater stability will be had if 150 volts of regulated d.c. is used for the plate supply, but even this is not absolutely necessary. Hand capacity was a little troublesome until a positive ground connection was made to the cabinet.

Tests with the noise generator show the noise factor to be better than many commercially-constructed converters but naturally the signal gain is not nearly so great in this single tube converter as in the multi-tube jobs. Most circuits using a single tube as both the oscillator and mixer are bothered with pulling of the oscillator frequency as the r.f. circuit is tuned and this one is certainly no exception. Since the r.f. tuning is more or less fixed this is not a great drawback in this case. On the air results were very satisfactory and while it is not intended to be a DX mans converter, it certainly is worth the time and money to anyone that would like to see just what this six meter stuff is all about.

Our thanks to W7BOC for his work with the camera.



Pi

The pi network is not as mysterious as some "authorities" would have you believe. Here is all the material you need to design pi-network tank circuits to simplify your rig.

Network Tank Circuits

E. W. PAPPENFUS, WØSYF*

and

K. L. KLIPPEL, WØSQO*

ONE OF THE MANY PROBLEMS facing the radio amateur who designs his own radio transmitting equipment is that of feeding the plate power developed by the Class-C final amplifier into a variety of antenna systems. After considering a number of the methods of feeding power into an antenna, the pi network has been chosen for further consideration. Periodically radio men have found that the pi network is very advantageous as an antenna coupler. We, too, have rediscovered the pi network, and have found that there are quite a number of advantages in using the pi in this application, and we hope to contribute some very handy design charts to make the application of this network a simple task for the amateur designer.

Since even the neophyte is familiar with the conventional parallel tuned circuits, we will use this for the starting point for the analysis of the pi network.

In *Fig. 1-A,* we show a parallel-tuned circuit in which the tank capacitor C_1 is connected from plate to ground and resonates with inductance L_1. The second parallel-resonant circuit, C_2 and L_2, connects from antenna to ground. Each of the parallel-tuned circuits connects to ground through what might be called a fictitious coupling resistance which we will call r_1. Actually the pi network is constructed conventionally as shown in *Fig. 1-B,* but, for convenience, analysis and calculation, it is useful to use the coupling resistance in *Fig. 1-A.* It is well known that a high-Q circuit can be considered to have a very small resistance in series with the coil, and it provides a very high resistance across the tuning capacitor. Through the proper selection of Q for the two parallel-tuned circuits of *Fig. 1-A,* it is possible to effect the transformation desired from the plate of the final amplifier to the coupling resistance, to the antenna. This selection of Q is made possible through the L/C ratio of the input and output parallel-tuned circuits. For a one-to-one

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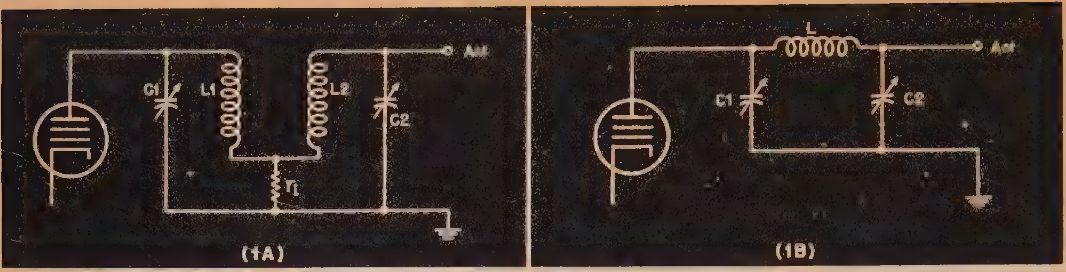
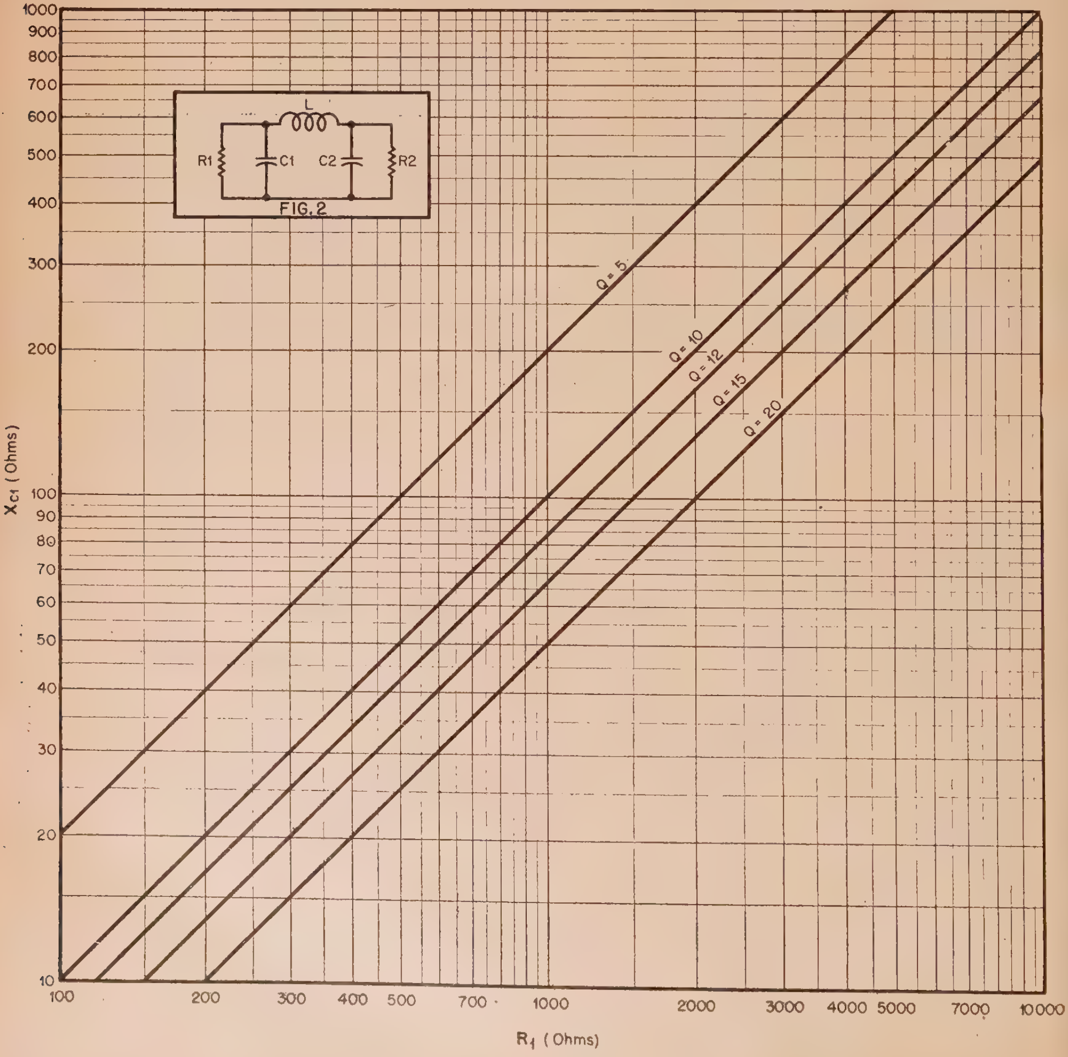
* *Collins Radio Company, Cedar Rapids, Iowa*



Figs. 1A, left, and 1B, right, illustrate the development of the pi network.

transformation ratio, that is, for a resistance of the antenna equal to the resistance presented to the final amplifier, the value of C_1 is equal to C_2 and, for a stepdown ratio from the plate to the antenna, as is normal practice, such as in feeding a 50-ohm transmission line, the value of C_2 is much greater than that of C_1. As the value of C_2 becomes larger and larger, the value of C_1 becomes smaller until eventually a single parallel-tuned circuit transforming the impedance presented to the plate of the final amplifier down to an image resistance results in a system identical with that shown on the left in *Fig. 1-A*. C_1 is normally considered to be the tuning capacitor and C_2 the loading capacitor. In operation C_2 is tuned to maximum and C_1 is varied for resonance. This provides minimum loading for the final amplifier. To increase the loading, C_2 is decreased and C_1 increased until the proper current



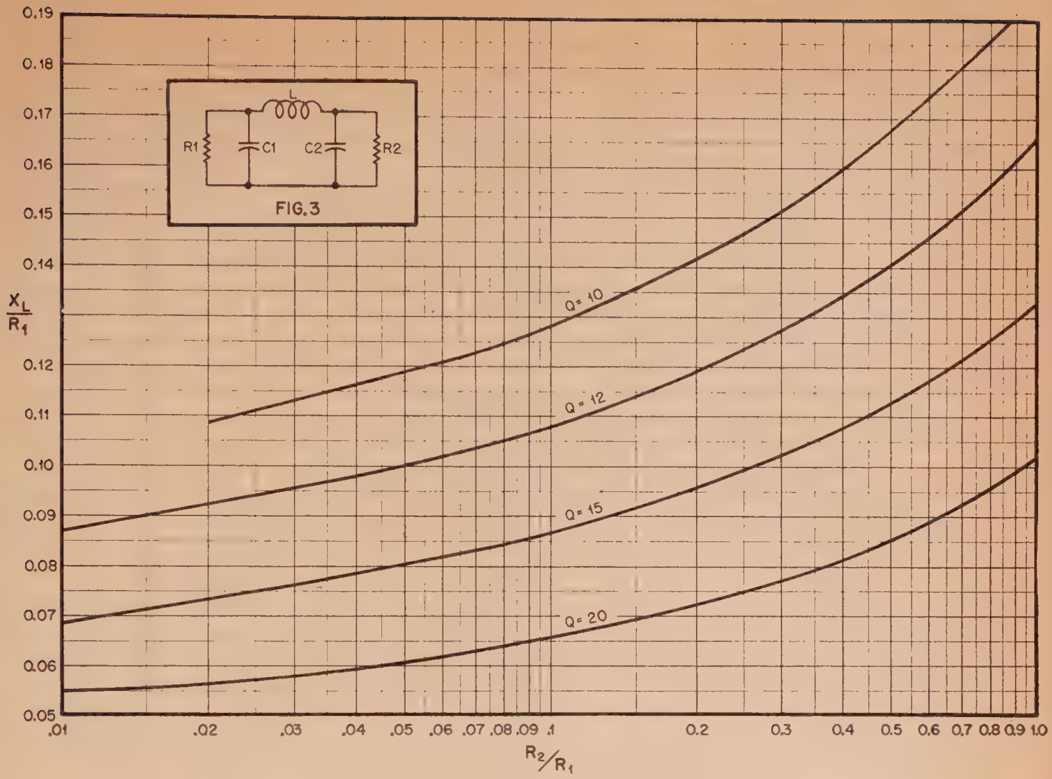


FIG. 3

These curves, Figs. 3 (above) and 4 (below) are the basic tools of pi network design.

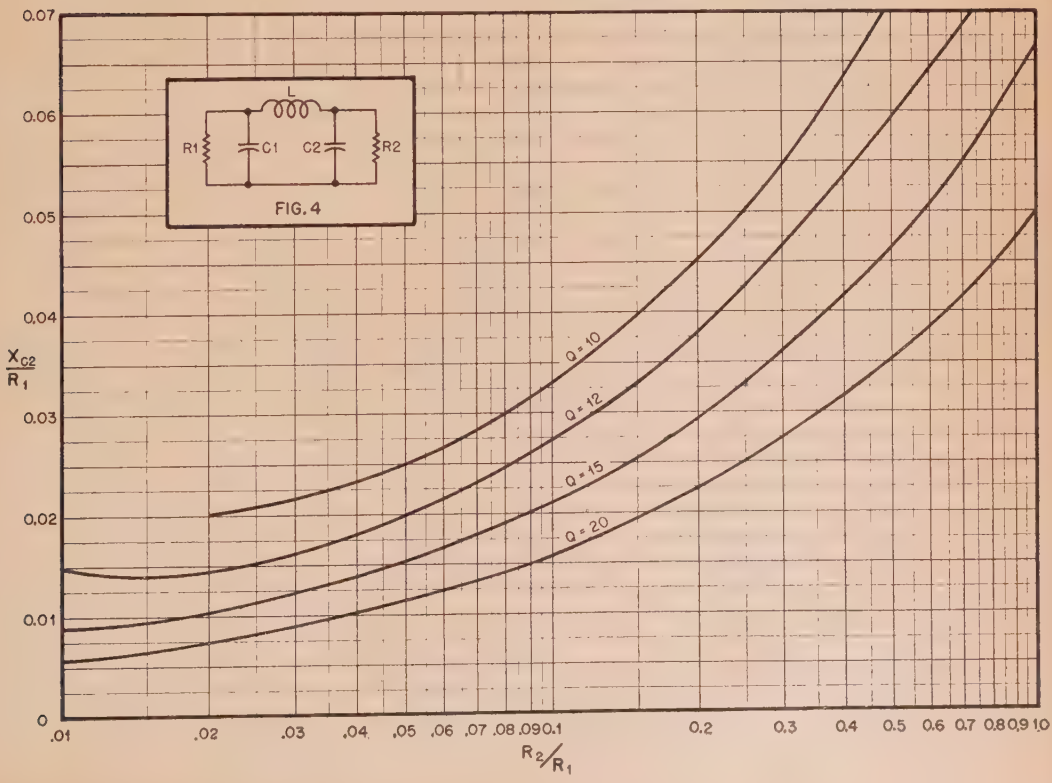
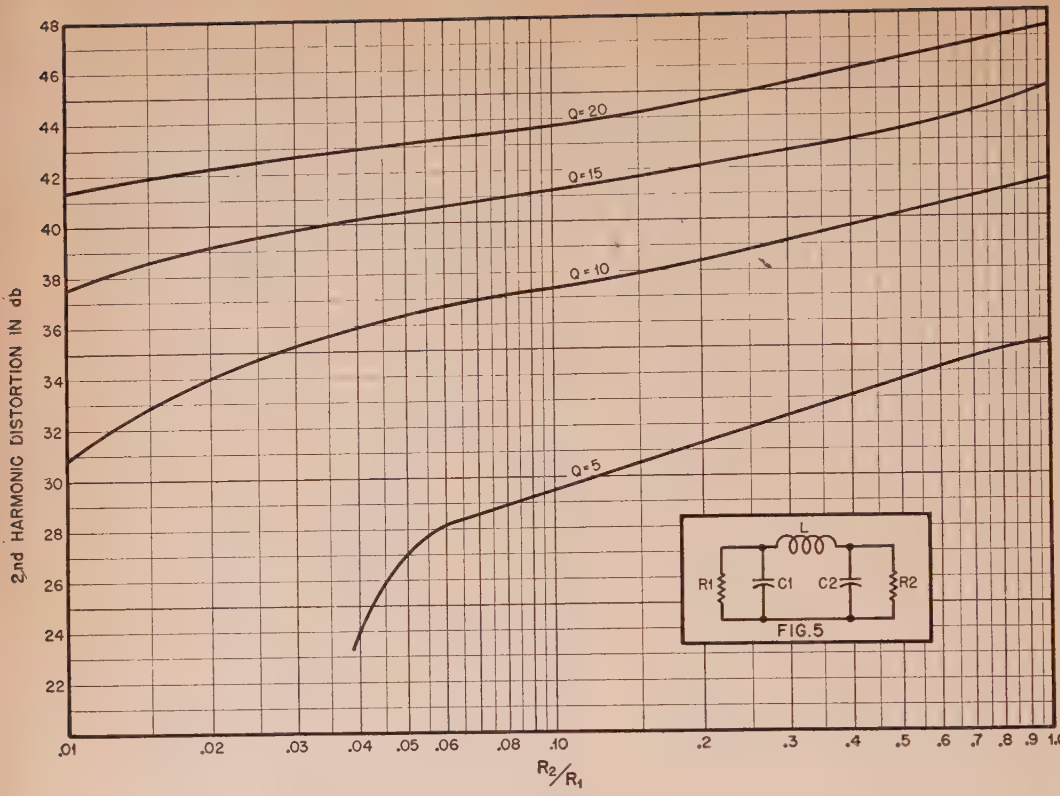


FIG. 4



The pi network will really attenuate those harmonics, as these curves show.

is drawn by the final amplifier. Resonance is indicated in the normal manner by minimum plate current. With a little pick and shovel work it is possible to prove that the values of X_{C_1}, X_{C_2} and X_L are equal to the following expressions:

$$X_{C_1}=\frac{R_1}{Q},\quad X_{C_2}=R_2\sqrt{\frac{\frac{R_1}{R_2}}{Q^2+1-\frac{R_2}{R_1}}},\quad X_L=\frac{QR_1+\frac{R_1R_2}{X_{C_2}}}{Q^2+1}$$

The value of Q in the above expressions is the operating Q of the final amplifier and is commonly chosen to be within the range of ten to twenty at the midpoint of the amateur band. R_1 is equal to the load impedance of the power amplifier tube, and R_2 is equal to the impedance of the transmission line which is properly terminated in its characteristic impedance, or very nearly so.

The equations expressed above are of general form and are perfectly satisfactory to use in the determination of circuit constants for a given network. It is apparent that the solution of these equations is time-consuming so it was decided to select arbitrary values for some of the variables and to solve for the others with the results being presented graphically. In the typical design case, one knows or can evaluate R_1 which is the plate impedance of the power amplifier tube under normal operating conditions.[1] The transmission line impedance is then selected. The selection of operating Q follows the same pattern as for a simple parallel-tuned circuit. So, if R_1 and R_2 and Q are known, it is easy to obtain the values of L, C_1 and C_2 by reference to the graphs. As can be seen by inspection, the graph of X_{C_1} is plotted on logarithmic coördinates while X_{C_2} and X_L are plotted on semi-logarithmic coördinates. The use of this technique enables one to cover much greater R_2/R_1 ratios without losing accuracy.

A Typical Design Problem

A typical design problem may be illustrated as follows: A pi network is to be designed to couple the plate power output of a power amplifier to an antenna. The plate impedance has been calculated[1] and found to be 2000 ohms. The antenna system has been well designed and the RG-8/U (51-ohm) coaxial line has a very low standing wave ratio. An operating Q of 15 has been selected.

$R_1=2000$ ohms (plate impedance)
$R_2=50$ ohms (line impedance)
$Q\ =15$ (selected)

The value of X_{C_1} may be read from *Fig. 2* by following the line representing 2000 ohms (R_1) up to the line representing the selected operating Q of 15. The value of X_{C_1} is then read off the X_{C_1} axis directly across from the point where the R_1 line

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[1] "Design Considerations for Class C Power Amplifiers," K. L. Klippel, *CQ*, May 1950.

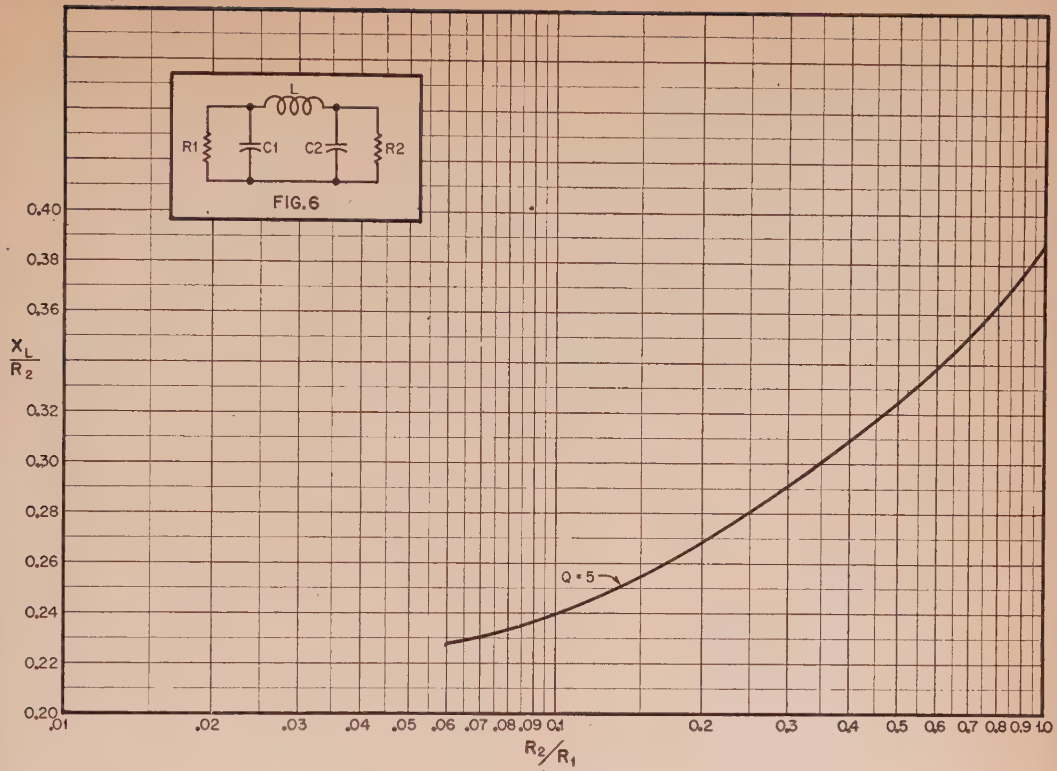


FIG. 6

These curves extend those of figs. 3 and 4 into the region where $Q = 5$.

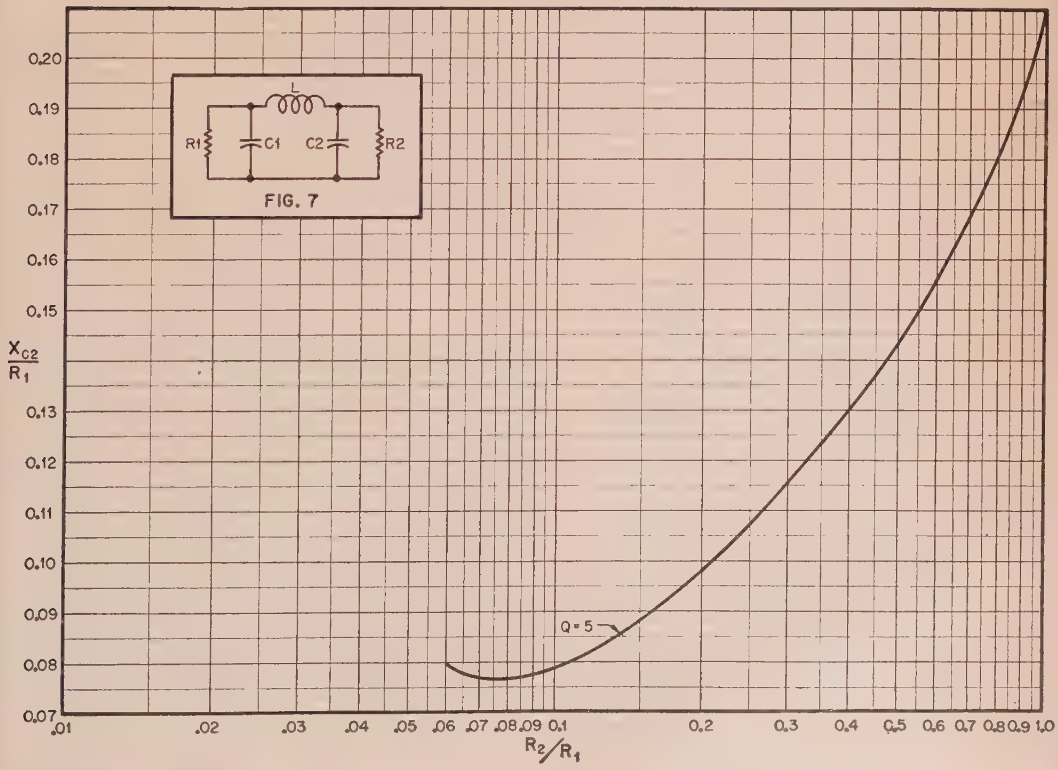


FIG. 7

The use of a pi network tank circuit means simple control of tuning and loading from the front panel.

and the Q 15 line intersect. In this case $X_{c_1}=135$ ohms. In order to determine L and X_{c_2}, it is necessary to determine R_2/R_1, which in this case is equal to 50/2000 or 0.025.

In order to determine X_L it is necessary to use *Fig. 3*. Find 0.025 on the R_2/R_1 axis and follow it up to the $Q=15$ line. Then read X_L/R_1 directly across from this intersection. In this case $X_L/R_1=0.075$, and, since R_1 equals 2000, $X_L=150$ ohms.

Figure 4 is used to determine X_{c_2}. Follow the same procedure used in determining X_L by finding the intersection of the line where $R_2/R_1=0.025$ and $Q=15$. By projecting this point over to the X_{c_2}/R_1 axis, it can be seen that $X_{c_2}/R_1=0.0115$, so 0.0115×2000 equals 23 ohms for X_{c_2}.

The design of the pi section is essentially complete. In order to determine the values of C and L in micromicrofarads and microhenries, it is only necessary to know the frequency to be employed. The actual values may then be calculated from formula or by a reactance rule.

After the pi network has been designed by the foregoing method, then quite often the reverse problem is presented to the designer because he is faced with a fixed value of inductance, as is the case in a bandswitching transmitter, and he must determine the value of X_{c_1} and X_{c_2} to present the proper load to the final amplifier when something other than the desired antenna resistance is applied to the load end of the network. If we assume in the preceding case that the antenna resistance is equal to 400 ohms with a ratio of R_2 to R_1 of 0.2 and X_L to R_1 of .075 we find that the Q is now about 19. Then, from the curves for X_{c_1} and X_{c_2} for a Q of 19, we find the values of 105 ohms and .0235 times R_1, or 47 ohms, respectively.

These two examples clearly show how the values of X_{c_1} and X_{c_2} vary with variation in load resistance with a constant value of X_L. The harmonic attenuation of the pi network with different ratios of input and output resistance is shown in the graph of *Fig. 5*. From this chart it is possible to predict quite accurately just what attenuation of the second harmonic can be expected from the pi network. Higher order harmonics are attenuated an even greater amount. The third and fourth harmonics are 12 and 20 db down respectively from the second harmonic for any R_2/R_1 ratio. At this point we would like to give credit to Bob Young W9IRN, of the Collins Engineering Department. His manipulation of the many complex quantities involved in deriving some of our data, particularly that pertaining to harmonic attenuation, was invaluable.

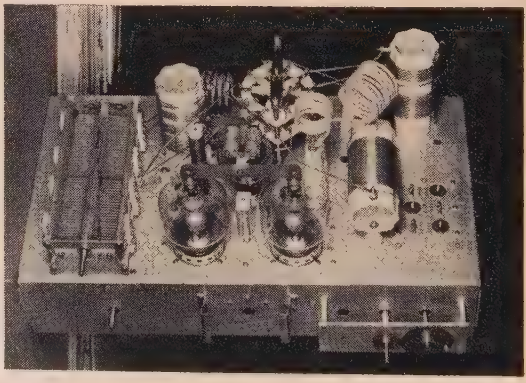
Advantages of the Pi Network

The pi network has a number of outstanding advantages which should recommend it to hams. This network has a maximum attenuation for a minimum number of tuning elements. With Kukla, Fran, and Ollie opposing normal ham activities, the matter of attenuation is very important. The network also has a smooth loading control and will load into a wide range of antenna resistances. It is also excellent for bandswitching because only a simple switch is necessary to short out portions of the tank coil and make possible operation on the various ham bands. With normally encountered feed line impedances, the voltage rating of the output capacitor is not great, and the voltage present across the input capacitor is no greater than that present in the conventional parallel-tuned tank circuit. The pi network does not offer as much advantage when used in a push-pull circuit, but with new low-capacity power tubes, push-pull operation is not so necessary for high-power circuits. Two tubes can be connected in parallel and operated into a single-ended pi network as described above.

Limitations

Contrary to general opinion, the pi will not load into an unlimited range of impedances. The minimum resistance that can be matched is somewhat greater than R_1 divided by Q^2. In the case of the earlier example, the minimum resistance would be 2000/225 or 8.9 ohms. Below this value peculiar action of the loading capacitor will be encountered and the system will load in reverse to the normal man-

(*Continued on page 69*)



The new Collins 1-kw amateur transmitter uses the pi network to good advantage.

MARS to Study Disaster Nets

Initial Hours Seen As Critical Period

MOBILE COMMUNICATIONS UNITS, ready to go into instant operation, and available to every population center throughout the nation, have been suggested for consideration by MARS Chiefs.

This need has been realized—is written into the Military Amateur Radio System mission. But the recent South Amboy, New Jersey, explosion which struck fear to the hearts of New Jersey and New York countrysides brought into sharp focus the critical need for immediate action. MARS Chiefs have delegated authority to MARS Command Directors to actuate and administer such mobile units. It is expected that eventually such equipment and teams to operate it will be standardized through the MARS.

An example of what they can accomplish was demonstrated at South Amboy. In the first moments of shock after the four gunpowder-loaded barges exploded in Raritan Bay, all power lines and communications links were cut. The mass fear and hysteria resulting from the awful detonation, the flying glass, the demolished buildings, were intensified by a ghostly rain which dampened and chilled the fear-numbed populace of South Amboy.

Mayor John B. Leonard proclaimed a state of emergency and asked for Red Cross relief and for military protection. Rutgers University ROTC MARS students, at nearby New Brunswick, New Jersey, rushed an SCR-399 to the scene. ARRL members, U. S. Naval Reservists, U. S. Coast Guardsmen, other amateur radiomen combined resources to form a coordinated communications network. But a great deal of time was lost in the formation. The critical period was actually the moment Mayor Leonard proclaimed an emergency state. New Jersey state police, at that time, had the only operating clear channel net. The *New York Times* newspaper said on 20 May 1950: ". . . lack of communications prevented the relief forces from obtaining a clear picture of conditions in South Amboy."

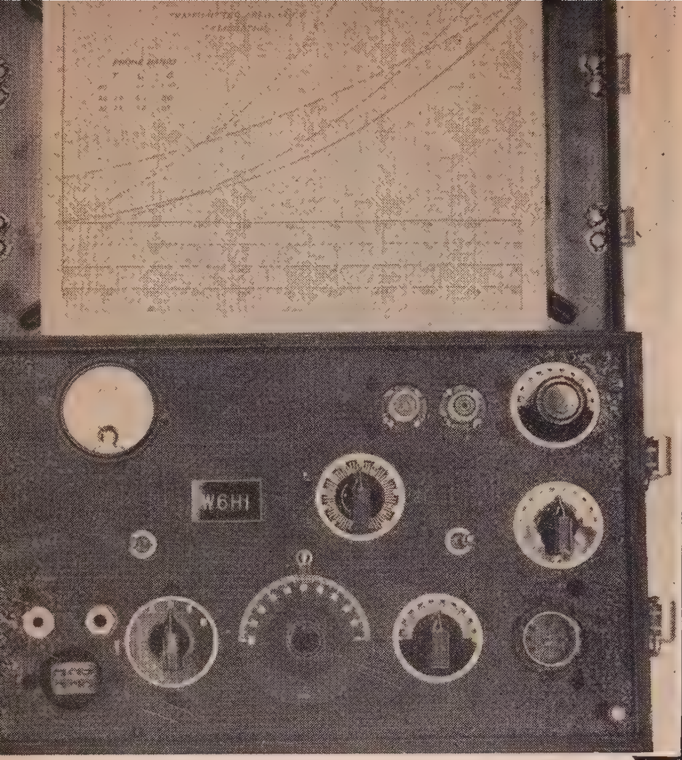
Perhaps the best example of how such a mobile unit could be used to best advantage was the Fort Monmouth MARS performance.

Fort Monmouth made available four mobile 500-watt stations. Two of the units were dispatched to South Amboy with the first contingent of troops which responded to Mayor Leonard's call. These mobile units established contact with A2MON enroute and upon arrival at Disaster Headquarters in the South Amboy City Hall they had set up a radio link through A2MON with A2USA, First Army Headquarters, Fort Jay; and with Army Headquarters Station, WAR, in the Pentagon, Washington, D. C. Private First Class Robert E. Gawryla, operator, was the network keystone; the MARS frequency of 4020 kc provided a clear channel for the net. Weather information, official military traffic, personal type messages, Red Cross traffic and press information were transmitted using A-3 emission to and from the stricken area.

The extreme flexibility of this net was evidenced by the many MARS stations who moved onto 4020 kc on a standby basis, ready to go on the air if needed.

Through coöperation with disaster officials, civilian and military relief organizations, and all other amateur radio facilities MARS Command Directors expect to build communications units capable of providing adequate disaster communications and capable of extending over as wide a geographical area as may become necessary.

Pfc R. E. Gawryla, Fort Monmouth, was the key man in integrating MARS and military nets during the South Amboy, N. J., emergency.



4 BAND MOBILE RIG

HAL BUMBAUGH, W6HI*

THE FACT THAT MOST MOBILE TRANSMITTERS are built to operate on one, or at the most two, bands, left us a little cold toward mobile in general until we decided to build an all-band phone-c.w. unit which would really make mobile operation a pleasure.

Our work along this line resulted in the transmitter to be described. It is capable of four-band mobile or fixed operation on either phone or c.w. and in addition provides for VFO operation on all bands.

A prime consideration in this type of transmitter is that of keeping the rig small in order that it will take up as little room as possible and yet be capable of sufficient power output to insure successful operation on all bands under almost any circumstances which will permit communication.

With this thought in mind, the rig was designed to occupy one of the small cases which housed the well-known Collins Transmitter and Receiver, the MBF, used during war-time and now available at very reasonable rates on the surplus market. These cases are light, ruggedly built, have a carrying handle or strap, and, with the detachable cover, afford complete protection for the transmitter.

Another important item in such a set-up is the power supply, and since such a supply is available on the surplus market at a very reasonable figure, this unit, the PE-103 Genemotor, was chosen to power the rig.

A glance at the wiring diagram might give the impression that there would be considerable crowding—inevitable when all the components were put on one chassis, but the photographs show this is not the case. There is plenty of room for all the components, and the circuit is perfectly stable, as indicated by the fact that no neutralization or shielding is needed for the 815 final on any of the bands.

The Circuit

The VFO circuit is a shunt-tuned Colpitts with the constants so chosen that the assigned frequencies for all bands eighty through ten meters cover nearly the entire 100 divisions on the oscillator tuning dial.

One of the features of the transmitter is that only commercial type coils (B & W Baby Coils) are used in the various stages. Being well-designed coils of high Q and easily replaceable in case of accident, they are ideal for the purpose.

These coils, however, are not used exactly as the makers intended, because in the oscillator section each coil operates at one half its rated frequency. These coils are shunted by small 0–30 μμf ceramic trimmers for use on the several bands, as will be explained later.

For tuning, all coils are shunted by a 3-plate Hammarlund 20-μμf straight line frequency con-

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724 N. Crescent Hts. Blvd., Hollywood, Cal.

denser. These condensers, together with the voltage divider condensers in the Colpitts circuit, serve to cover a band of frequencies such that, after passing through the doubler stage, the desired band is just covered. Thus, for twenty meters a twenty-meter baby coil is used in the oscillator position, but the oscillator output frequency is not 13,800 to 14,500 kc, but 6,900 to 7,250 kc. This arrangement permits the bandspread shown in the calibration curves, as well as doubling in the second stage for all bands. The final stage in all cases works straight through without the need for shielding or neutralization.

The tube chosen for the oscillator is, although strictly a video tube, ideally suited to this purpose since the circuit permits electron coupling to the load circuit with the resultant freedom from load conditions being reflected into the oscillator circuit proper. This tube, the 6AG7, was also chosen for the doubler stage because of its good power output. And the tube is so well shielded internally and the interelectrode capacities so relatively small that straight-through operation may be had if desired without the need for neutralization.

A 4-watt 50,000-ohm potentiometer feeding a variable voltage to the screen grid of the 6AG7 doubler gives complete control of the grid mils in the final on all frequencies, thus assuring optimum conditions and full output on any band. As an example, this potentiometer is nearly "off" on eighty meters and nearly "full open" on ten meters to keep the normal 4 to 6 grid mils in the final.

The modulator is fully capable of modulating the rig 100% under all conditions with the gain control between one third and one half open.

Figure 3 is the wiring diagram for the radio frequency, audio, and control circuits.

A "PHONE-C.W." switch located on the front panel serves to render the keying circuit cold on phone and the modulator cold on c.w. thus conserving full power for the mode of operation in use.

Remote Control

A small remote control box makes push-to-talk phone, or c.w., possible from a point distant from the transmitter, as well as at the transmitter proper, as all controls are in parallel. This remote control box may be of any size and shape that suits the constructor's fancy, but it is suggested that the wiring diagram as given be followed closely, since the desire to operate the pilot lights without the use of relays makes the arrangement a bit tricky. In the remote box shown in the sketches and photographs, the upper left-hand pilot light is a green one which comes on when the upper toggle switch is thrown to the right. This indicates the transmitter filaments are on and also serves to interlock with the lower toggle switch. In the left-hand position, this lower toggle switch sets the rig up for phone and allows the push-to-talk button on the microphone—plugged into the left-hand jack—to start up the Genemotor, whereupon the upper right-hand red pilot light comes on. In the position to the right, this lower toggle switch sets the rig up for c.w. and starts the Genemotor, whereupon the rig can be keyed by a key inserted in the right-hand jack. Of course the "PHONE–C.W." switch on the transmitter front panel must likewise be set for the mode of operation desired.

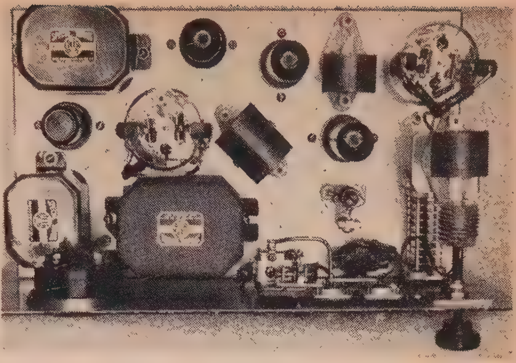


Fig. 1. The above-chassis view, showing the layout of the several stages.

While the simplest way to operate the rig either remotely or locally is always to use the remote control box, it is possible to dispense with this control for local operations at the transmitter by preparing two 6-pin Jones plugs (female), similiar to the one on the transmitter end of the control box cable, as follows: For c.w. operation, shunts should be soldered across pins *4* and *6* and across pins *1* and *3*. When plugged into the transmitter, this will take the place of the remote control box. In a similiar manner a plug may be prepared for phone operation by soldering a shunt across only pins *4* and *6*.

When using the remote control box, the Genemotor cannot be started up for either phone or c.w. unless the filament switch is turned on, which affords protection against either unintentional starting or meddling by the uninitiated.

Filament control and keying are both accomplished by means of relays, and the antenna is automatically switched by another small relay, or a separate receiving antenna may be switched if desired.

The left-hand toggle switch on the front panel is normally closed, but opening it permits oscillator and doubler to function so that the rig can be set on zero beat with some wanted station that is being received without this operation being heard on the air. In some circles this is known as "non-swishing!"

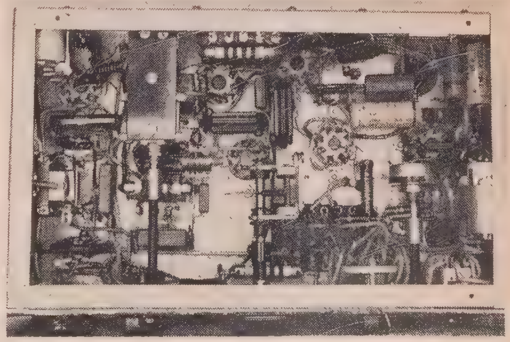
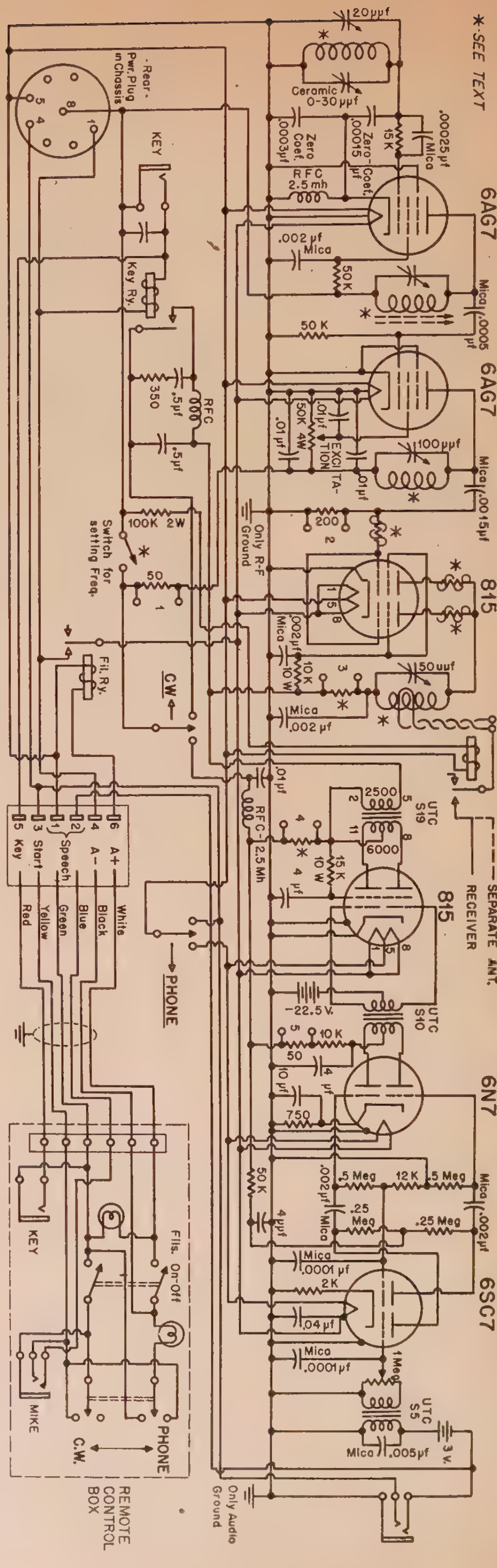


Fig. 2. The under-chassis view illustrates the placement of the smaller components.

Fig. 3. The complete schematic of the entire rig.



For the final stage and the modulator, the 815 was chosen as representing the best available tube for the purpose and for the power supply to be used. The 815 is a sturdy double beam tube ideally adapted to withstand the vibration of mobile operation. Furthermore, its general design lends itself readily to compact construction and short connections, and, at the same time, possesses the further advantage of low grid drive requirements. It functions equally well as a modulator and is just the thing to modulate the 815 in the final. The screening of the tube is such that, with well-engineered circuits and care in layout and wiring, neutralization can be dispensed with. Furthermore, it does not, like a number of other tubes, require external shields.

A Western Electric F1 unit was chosen for the microphone because of its high output and its good frequency characteristic for amateur communication. The unit was mounted on one of the popular T-17B units in place of the microphone which originally came with that unit. These F1 units are available from most surplus houses at a reasonable figure or may be had from jobbers handling Western Electric or Graybar parts and equipment.

Button current is obtained from two medium-size flashlight batteries, which insure a perfectly clean carrier.

As may be seen from the photographs, the wiring is simple and straightforward, and while the constructor will naturally follow his own habits in wiring and placement of parts, it is suggested that the placement of the oscillator and doubler tuning condensers not be changed, since in the positions shown the leads to their respective coils are the shortest that can be physically arranged.

The audio gain is set by means of a 1-megohm potentiometer, the shaft of which emerges from, and its end flush with, the front face of the panel. A screwdriver slot in the end of the shaft permits setting the gain at any desired value from the front of the panel without the necessity of removing the transmitter from its case.

Complete metering of all important circuits is had by means of a selector switch mounted on the front panel.

A miniature meter with a 0–100 milliampere scale is used and reads all metering positions directly, with the exception of the plate current in the final and the plate current in the modulator. In these two positions a shunt is automatically applied at the switch, which doubles the meter readings. This is shown in *Fig. 4*.

Power Supply

All power is obtained from the PE-103 Genemotor operating from the 6-volt car battery. Twelve-volt operation is also possible with the PE-103.

While the PE-103 can be used "as is," there are a couple of suggested changes which are to be recommended. First, a 10-ohm 10-watt resistor should be shunted across the actuating winding of the center circuit breaker (3 E 3). As originally set up this breaker opened the high-voltage circuit when the load reached about 160–200 milliamperes. Since we wanted the protection of this breaker and yet expected to draw loads considerably in excess of this value, and since the resistance of the actuating winding was 10 ohms, all that was necessary was to shunt this winding with another 10 ohms, whereupon the breaker would trip at approximately 320–400 milliamperes.

Secondly, the 12-volt brushes were removed from the Genemotor to decrease the drag on the armature, but whether this refinement is of great value remains to be seen.

Connecting cables with plugs which were a part of the original PE-103 equipment are available on the surplus market, and two of them should be obtained, one to connect the Genemotor to the transmitter, and the other to furnish a male plug which is detatched and mounted on the front panel to receive the power cable.

The entire transmitter is mounted on a standard cadmium plated chassis measuring 12×7×3 inches. This size chassis is just right to fit the MBF case in which the transmitter is housed.

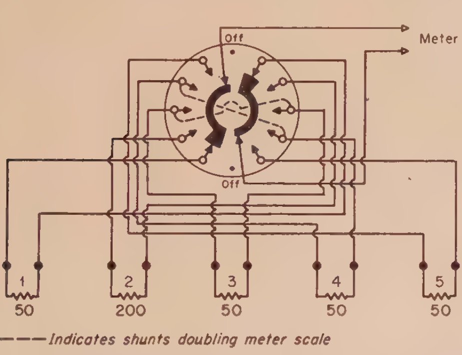


Fig. 4. This circuit permits reading of all currents with a single 100-ma meter.

All controls appear on the front panel, hence the chassis can be instantly removed or replaced without disturbing any connections.

A six-conductor shielded cable runs from the transmitter to the remote control box and carries all speech and control circuits.

The surplus market also provided a small National Velvet Vernier dial which is used to drive the oscillator tuning condenser.

The 815 in the final has the sections connected in parallel, and the common grid lead has a 100-ohm resistor in series. This resistor is wound with 6 turns of #18 tinned wire. The plate leads each contain a 100-ohm resistor, one wound with 7 turns of #18 tinned, and the other with 8 turns.

A bias of 22½ volts is furnished the 815 modulator by a small hearing aid battery (Burgess U15E.) While this is a somewhat greater bias than is normally recommended for the 815, the stability is very good, and the audio output is more than is needed for full modulation with excellent quality.

Omission of the cathode resistor by-pass condenser in the 6SC7 stage is for stabilization.

Construction

While the construction of the transmitter is easily seen from the photographs, there are several points on which there should be some elaboration.

Coils for the oscillator section were, as mentioned earlier, of the B & W Baby type for each band. For the 10-meter band no small ceramic trimmer was needed in shunt with the coil. On the 20-meter band two 0–30 μμf trimmers were used, one on each side of the coil and resting on their sides on the coil base. These were used to adjust the frequency placement. On the 40-meter coil only one condenser was used. On the 80-meter coil two were again used, as on the 20-meter coil.

Standard Baby coils were used in the plate circuit of the double stage, but it was necessary to remove some turns on all bands. The number of turns remaining on the coils for the various bands were:

10	meters	3	turns
20	meters	9	"
40	meters	16	"
80	meters	31	"

As in the case of the doubler stage, B & W Baby coils were used in the final stage, and again it was necessary to remove some turns. The number of turns remaining on the coils for the various bands were:

10	meters	3	turns
20	meters	9	"
40	meters	16	"
80	meters	31	"

As a means of insuring optimum output from the electron coupled oscillator plate circuit, small slug-tuned coils were used and were adjusted to be resonant to the mid-band frequency in each case. They were made plug-in for ease in band changing. The forms were the ⅜-inch forms of the Cambridge Electronics Corp. They may be purchased in several frequency ranges, these ranges being calculated on the basis of the coil being shunted with a 0–30 μμf trimmer condenser. It is best to buy the coil whose range falls slightly below the wanted frequency so that by removing turns the correct frequency can be obtained. In the case of the 10-meter coil, all the original winding was removed and replaced by 10 turns of #30 enamel closely wound in the center of the winding space. Cambridge Electronic Corp. designates these forms as LS 3 with G 2 slug.

To mount these coils, polystyrene adapters designed to adapt the new crystal pin spacing to holders for the older and wider spacing were used. A 15/64 inch hole was drilled in the polystyrene in the center of the form and in the same direction as the pins. The threaded brass extension on the bottom of the coil form was then screwed into this hole until the form was seated on the polystyrene. After a small 0–30 μμf ceramic trimmer was soldered across the terminals on the coil, form wires were soldered from these terminals to the top of the pins in the polystyrene form.

The entire unit was then mounted in a two-hole ceramic crystal holder set into the top of the chassis. In our case we ran the slug to the top of the form,

(*Continued on page 58*)

VHF UHF

Conducted by E. M. BROWN, W2PAU*

Although the month of July, 1950, has brought no reports of new record-breaking DX on the higher bands, (now that this is printed, someone is sure to come along and prove us wrong!) conditions have been good, activity has been at a fairly high level, and the faithful followers of the v.h.f. bands have had plenty of incentive to stay close to their rigs during the hot summer nights.

The six-meter crew had the best break as far as conditions are concerned. Sporadic-E openings have been coming along almost daily, this season. Some of these openings have been tremendous in scope. On June 27th a nation-wide opening during the evening hours gave the gang all the business they could handle. And on the 16th of July, from dawn to dusk, the old E layer was bouncing six-meter signals back to earth stronger than they were going up! Ask W5LF—he was putting out a strong signal by loading his rig into a soldering iron as a dummy load! DX signals have had the TViewers raving about the efficiency of the new antennas they hopefully erected to get rid of the snow. Perry Ferrell's RASO Project is doing a booming business. After glancing through some of the reports which have been received during the past few days we can understand why O.P. wears a perpetually worried look. W9ZHB's report for June, for example, looks about as thick as the Philadelphia Telephone Directory! The newly-installed automatic sorting machines are running red—one of them even suffered a nervous breakdown recently! In short, six meters has been *HOT*.

The two-meter band has been up to a few tricks, but it somehow did not live up to expectations, this month. Weather conditions have been rather unstable in many parts of the country. In Europe, things were better. On June 28 G5BY hooked DL3FM for a new European two-meter record—470 miles. Complaints about the poor conditions over here were numerous. W0ZJB reports that except for a slight opening on July 4th which brought in signals from over 300 miles away the band has been abnormally poor. Here in the East, hot, humid weather has prevailed, which should presumably have done the band some good. However, conditions have not been sufficiently stable to set up a good long-haul opening. Frequent thunder storms, occasional cold fronts moving in, and often gusty winds have spoiled the chances for any real tropospheric DX work. The average conditions are still far above normal (normal, in this case, referring to cold, windy, mid-winter weather) for distances up to about 200 miles. Some of the newcomers to the band are already predicting that the 100-mile plus QSOs which they make easily every night this time of year are normal—wait a few months, fellows! A few good openings crept in, in spite of the wind and lightning, and there were stations on hand to take advantage of them. On the 11th of July a combined aurora and tropospheric opening provided plenty of excitement and new states for the hopeful few who stuck around until the late evening hours. W3BYF, W4AO, W1HDQ, and a few others held the fort in the East, while W8WXV, W8RWW, W3QKI, W9EHX, W9WOK and others were active in the midwest area. More on this later.

Quite a few of the better-equipped stations in the East have realized that in order to work the confirmed horizontally-polarized stations in the West they will have to conform. W2NLY, W2WJS, W2PJA, W2TP, W1JKC and others in the New York area now have horizontal available. South Jersey is represented by W2JAV, W2DAJ, W2EH, W2PAU, K2AZ, and—wonder of wonders—W2BV *mobile* who now has his 32-element mobile array rigged so that it can be flipped from inside the car! In Dalaware, W3ASD (144.95) is now equipped with horizontal, with W3JDP, W3LML, and others expected to follow suit soon. Karl, W3ASD, has had several QSOs with W3RUE in Pittsburgh, and at the last count had gotten over the hills into Ohio on about nine separate occasions, so far this season. Most of the stations farther south, in the Baltimore and Washington area, have both polarizations available to facilitate contacts both to the North and the South! Lest these words be misinterpreted, Ye Ed hastens to add that the majority of the stations active in the Northeast are still vertically polarized. The cases cited above represent a small percentage of the total active on two meters, and one's chances of obtaining QSOs east of Harrisburg, Pa., north of Baltimore, and all the way up the coast to the limit of activity, will be improved by the use of vertical polarization. (And, for the record, we still haven't decided which system works best, here. Both polarizations act about the same, except that we get more TVI on horizontal!) There is no doubt that sooner or later we will have to decide to standardize on one system or the other to do the best work on the two-meter band.

The 420-mc gang has been busy improving equipment, and trying to attract new converts to their band. We have not heard of any recent record-breaking contacts, but the paths which have been broken down in the past seem to be easily re-opened. W2QED and W3OWW have repeated their 85-mile hop several times, and are conducting almost nightly tests. G5BY's record of 161 miles still represents his best two-way QSO, but he has practically duplicated the feat by making crossband contacts with G6LK (161 miles) and with G8DM (140 miles). He has also repeated the 119-mile two-way contact with G3EJL several times. W7QLZ and W7FGG have been conducting mobile tests. Their first attempt was not too successful—they set up on two mountains 165 miles apart, made contact on two meters, but then Jerry, W7FGG ran into troubles and had to QRT before 420-mc tests could be run. Clyde, W7QLZ, worked W7KWO in Phoenix, about 90 miles distant, on both two and ¾ meters. Running the same powers and the same types of antennas on both 144 mc and 435 mc at each of the stations, the signals ran about 1 S-unit better on 435 mc. W7QLZ states that he has abandoned his parabolic antennas in favor of stacked Yagis, but he uses large-diameter tubing as elements to keep the loss down and to broaden the response.

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* *Associate Editor, CQ. Send contributions to E. M. Brown, 88 Emerald Avenue, Westmont, Collingswood 7, N. Y.*

Our request for comments on whether you guys would prefer to have us encourage the use of ultra-simple equipment on 420 or hold out for the use of narrow-band techniques brought forth a very lukewarm response. None of our correspondents came out strongly in favor of modulated oscillators and superregenerators. A few, notably W1PBB, W3OWW, W4HHK, W4LDW, G5BY, and K2AH have expressed themselves in favor of stabilized techniques. Several of the gang want to know "if it's so easy to build good super-het converters using crystal detectors, why don't you print the dope on how to build 'em?" That's a good question! *Short Wave Magazine*, a British publication which is roughly equivalent to *CQ* in size and scope, has published articles on this subject by G3MY, in November 1949; G5BY, in May, 1950; and by G3EJL, in the June, 1950, issue. Each of these converters was easy to construct, and, judging from results, they work! We would welcome the opportunity to publish similar information in *CQ* magazine. Certainly there are some of you fellows who have designed and built reproducible low-noise 420-mc converters—or is my faith in the inventiveness of the American Ham misplaced? Should we try to obtain rights to reprint the British papers listed above, or will you fellows who have the straight dope at your fingertips come through with stories that we can print? Contact our Editor for details on preparation of manuscripts, rates, etc.

Six-Meter Notes

It would be next to impossible to report the big openings of the past few months in any detail in this column. In such a necessarily brief review we could not even begin to mention all the calls heard and worked—there just isn't enough space available. And, as much as we all like to see our own calls in print, I'm sure that it is not making the best use of this space to list page after page of six-meter QSOs unless they are of a really exceptional nature. The RASO Newsletter contains a fine summary of the day-to-day activity on the six-meter band. If you are not already in the Project and receiving this letter, it would be well worth your while to join up—the privilege of receiving this newsletter and the knowledge that you are making good use of your amateur operating activities are ample rewards for the small effort involved in sending in regular reports.

Six-meter operators in the northwestern part of the country have for some time been hearing "FSK" signals—probably multiplex teletype—on frequencies near the low end of the six-meter band. In fact, during band openings, the modulation on these signals has been heard well inside the lower limit of our band. Occasionally, these, or similar signals, have been noted operating far inside the lower edge of the band. During a good opening on July 1, one of the most active six-meter operators in the northwest received a land-line call requesting him to QRT because he was interfering with the operations of the CAA Alaskan Net. Subsequent investigation revealed that the "FSK" signals originate from a chain of relay stations operated by the CAA across Alaska. These stations are automatic, receiving on one frequency, transmitting on another. As a result, an interfering signal leaking into the system is passed along through the chain, and it is difficult to ascertain, without shutting down the system point-by-point, just where the QRM is coming in! It is apparent that these stations are operating very close to, if not actually within, the six-meter ham band. For this type of service, receiver band-widths must necessarily be fairly broad, not only to accommodate the signals, but to allow for random drifts of the receiver and transmitter oscillators and the receiver i.f.'s. It seems as though occasional interference should be expected in these circumstances. A temporary solution for the ham would be to QSY higher in frequency to get out of the pass-band of the system. It is obvious, though, that the whole problem should be dumped right back into the laps of the FCC and the CAA. It seems like pretty poor engineering to assign a shared frequency in this case, where one of the services involved is definitely a public necessity. This assignment might have been considered on the basis that sporadic-E DX transmissions do not occur for a great percentage of the time, but hams are allowed to use frequencies from 50.0 to 54.0 mc in Alaska, Canada, and in the entire United States, with no geographical restrictions that we have heard about. If you have any further information which might help throw light on this situation, *Perry Ferrell, RASO Project Supervisor, 121 S. Broad Street, Philadelphia 7, Pa.* has offered to act as a clearing house for such information.

W9MBL has been operating his "beacon" transmitter on 50.1 mc for the past several months, using an input of about 30 watts, into an omnidirectional antenna. The six-meter gang have learned to recognize the automatic "W9MBL W9MBL W9MBL" signals repeated every 20 seconds. The rig can be distinguished by a slight, but definite, backwave on the keying. There have been enough cases where this rig was the only one spotted during some of the scratchier band openings to prove its value. Some of you fellows who have plenty of spare room and can scrape together the necessary gear to put a little rig with automatic identification on the air during those periods of time while you're around the shack but not able to devote full time to operating should give the idea serious thought. As yet, the QRM on six is not so bad that we can't stand another signal!

The poll on the "Six Meter Calling Frequency" question has finally been analyzed. The majority of the stations polled were in favor of a specific calling frequency. The count between various suggested frequencies was close, but it appears that 50.1 mc was the most popular. The idea of a "calling frequency" is based on the fact that there is often very little activity on the six meter band—especially

(*Continued on page 63*)

DX AND OVERSEAS NEWS

Conducted by HERB BECKER, W6QD*

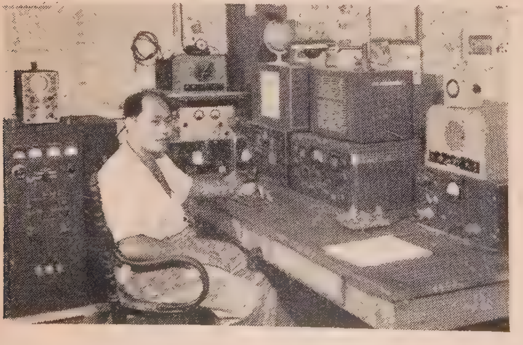
THE THIRD CQ WORLD WIDE DX CONTEST takes off the last weekend in October for the phone boys and the c.w. gang will take over the first weekend in November. The rules are the same as they were last year, and they were printed in detail in the August issue. Reprints of the rules, as well as contest log forms, may be had by sending a self-addressed envelope to our New York office, *CQ Magazine,* 342 Madison Avenue, New York 17, New York. I have been trying to arrange for good conditions, and let's see how much pull I have when the contest rolls around. . . . Either way, it won't be my fault!

Congratulations are in order to the following DX-men for achieving WAZ. Certificates have been awarded as follows:

216	VK2NS	Trevor Evans	40–191
217	KH6CD	Howie W. H. Lee	40–176
218	W7LYL	G. W. Adams	40–143

St. Pierre et Miquelon

By this time, it is old news, but our friend, Bill Orr, W6SAI, has done more than his bit to give the boys a new country. Bill, in signing *FP8AC,* has really knocked them off. . . . W8SYC is doing a couple of things. . . . First, he has been transfered to the day shift, so he is figuring on taking a crack at the early a.m. stuff. Secondly, he is about set to move to a new QTH, but he doesn't say where it is.



DU1VVS is one of the most active Philippine hams on 20 and 10, phone and c.w. The BC-610, SX-28A, and three separate antennas make 1VVS a frequent entry in W logs.

W6DZZ wants to know if FB8ZZ is a separate and different country. Unofficially, we doubt that it will be, but hope that it will eventually be counted in with Kerguelen. . . . W2BJ is still hoping to get a card from *FO8AC* who says he has mailed three of them. . . . W5LVD has given up certain things and taken on other repsonsibilities. He sold his rig, beams, and all but his QSL cards. Why?? Well, he has just recently been married, and his company transfered him to a new QTH in Harlingen, Texas. He says that all is not lost, however, because he managed to save an automatic band-switching low-power rig.

W2EMW still managed to work new ones in spite of the fact that he works nights at the post office. I think Bob deserves credit for his rather imposing total, especially in view of the fact that he does not have a fancy beam, but instead uses a simple Zepp antenna.

CE3AG had his card returned from *CZ1BO,* so he scratched this one. . . . W6AM stopped by to see W7KWA in Reno, Nevada, and he says Walt is very proud of being at the bottom of the WAZ column. Don says that KWA has a simple vertical wire for an antenna and usually makes one call and has 15 or more DXers calling him wanting Nevada for WAS.

VE2BV is getting all set for the October–November "rat race," as he puts it, and he might be about right at that. . . . W6EFM says he won't forget FP8AC for a long time: this involved a lot of kicked shins, etc. He adds that SAI must be pretty rugged!! Our hat is off to Bill for a swell job.

A new addition to the Honor Roll is *F8TM.* He said he had a cool one the other day with F8EX and they talked considerably about *FB8XX* and 8ZZ. . . . It seems that 8XX is QRM shy, and 8ZZ is a military operator!! HC2OT is happy after snagging the missing four Zones . . . 18, 19, 23, and 39. The QSL card has arrived from Zone 39, and now he is waiting for the rest of them.

W9ABA tells me that his old crony, W6WKU, is back in town, and he has a bet with him that he won't do as well as he did in W6. Does he mean on Channel 2? W6MX received his cards from *CR10AA* and *VK1FE.* . . . KG6GD sends in a batch of new countries worked, including his last zone which happened to be *ZD2FAR.*

W2WZ worked a good one in *FU8AD* and also another one, which is not too common, *W0BFE/KJ6.* . . . LU8BF, DX Editor of *Radio Onda,* tells me that the first Argentina DX certificate went to LU8CW, and the last, at the time of writing the

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* *Send all contributions to Herb Becker, 1406 South Grand Ave., Los Angeles 15, Calif.*

W. A. Z. HONOR ROLL

CW & PHONE

WAZ

W1FH	234
W6VFR	233
W2BXA	228
W6EBG	226
W6ENV	226
W3BES	225
W6GRL	224
W3GHD	224
W6ADP	224
W6PED	223
W6MEK	222
G6RH	222
G6ZO	222
W3LOE	221
W0YXO	220
W8BHW	218
G2PL	216
W2PEO	215
W6FSJ	215
W6SN	215
W6ITA	214
W4AIT	213
W3EVW	213
VK3BZ	213
W0PNQ	213
W6TT	212
W6AM	212
PY1DH	212
W6SYG	211
W6MX	211
W6NNV	211
VE7HC	211
VK2ACX	211
W6SAI	210
VE7HC	210
W9VW	209
ZL2GX	209
W6MJB	209
W2AQW	208
W8HGW	208
W9NDA	208
ZL1HY	208
W6SC	207
W6OEG	207
W2AGW	207
VE7ZM	206
W4BPD	206
W6DZZ	206
W7GUI	205
LU6DJX	205
W6MVQ	205
W6DI	204
W6PKO	204
VK2DI	204
KH6CT	204
CE3AG	204
W4CYU	203
ZS2X	203
VE4RO	203
W8BRA	203
W6RM	202
W6OMC	202
W6PB	202
W7AMX	201
W6PQT	201
W6BPD	201
W9KOK	200
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W2IOP	197
PY1AJ	196
W6WB	196
G2FSR	196
G4CP	195
W5KC	195
G6QB	195
KH6IJ	194
W6GAL	193
W6DLY	193
W6EFM	193
W6RBQ	193
W6AVM	192
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W0DU	192
W6GDJ	192
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W6SA	184
W6UCX	184
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W6KRI	181
G8IG	181
W0ELA	181
W6EPZ	180
W6IFW	180
OK1FF	180
W8SDR	179
I1KN	179
W6UHA	179
KH6QH	179
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W7DL	177
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OK1LM	172
W6SRF	171
LA7Y	171
W0SQO	171
PY1AHL	171
W6BAM	170
W6PZ	169
KH6BA	169
W5AFX	169
W6JZP	168
W6ANN	167
VK3CN	167
G2VD	167
W6DUC	166
KH6MI	166
W6CEM	166
VE7GI	165
W6LRU	165
W6BUD	165
W6LN	165
W6EAK	163
W6YZU	163
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W6JK	163
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OK1HI	162
W6PH	162
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W7ENW	162
VK4EL	162
W6PDB	161
W6PUY	160
JA2KG	160
W6MHB	160
I1IR	158
W6CYI	157
W7BD	157
W0OUH	157
W7BE	156
KH6LG	156
W6BAX	155
G3AAM	154
W6KEV	153
G3YF	152
VK2QL	151
OK1SV	151
W6LEE	150
W6FHE	150
W6EYR	150
W6LDD	150
OK1CX	147
W6LS	147
W6RLQ	147
W7DXZ	146
W6AYZ	146
VE6CD	146
W9NRB	145
W6MUC	145
W6QD	145
W6MUC	145
W6LER	145
KH6VP	145
ON4TA	144
G3BI	144
W6RLQ	144
KH6PY	144
W7LYL	143
W6ONZ	139
W6ID	138
ZC1CL	138
OK1WX	135
G3AZ	133
W6TEU	133
W6RDR	133
W6OBD	131
ZS2CR	131
W7ASG	129
W7GBW	127
G8IP	127
G5BJ	126
PK6HA	124
G5VU	124
W6BIL	124
W6NRQ	123
W6MLY	123
ZS6CT	113
KG6AL	103
VK6SA	103
W7KWA	98

39 Zones

W8NBK	219
W3DPA	218
W3KT	217
W9ANT	216
W0NUC	211
W2NSZ	211
W3IYE	209
W1ENE	209
W9RBI	209
W1BIH	209
W2HHF	208
W3JTC	208
W1JYH	208
F8BS	205
W3EPV	203
W9IU	201
W2HZY	209
W5ASG	200
W4GG	197
W3OCU	196
W2GWE	195
VE3QD	195
W2WZ	193
W2CWE	192
W3JNN	191
W1HX	191
W2AGO	191
W1AWX	191
W2EMW	187
W3DKT	187
W3JKO	186
W8SYC	186
W9LNM	186
W0EYR	186
W9MXX	185
W8RDZ	184
W1ZL	184
W3DRD	183
W4INL	183
KP4KD	182
W1DQH	181
VO6VP	179
W6EHV	178
VE3IJ	177
W2CNT	173
W8CVU	172
W4LVV	171
W9LM	170
OE1CD	170
W6CTL	169
W1NMP	169
W3JTK	169
OZ7EU	169
PY2AC	168
W4DKA	168
F9BO	167
W2CYS	167
OK1VW	167
W2BJ	166
W4VE	166
W8LEC	166
W7PGS	164
W9FKC	163
W3KDP	162
W4BRB	162
VE3AAZ	161
W2RGV	161
W6BZE	161
W4RBQ	160
W4AZK	159
W0GKS	158
W4OM	158
W0AIW	157
I1AY	157
W9YNB	155
DL1FK	155
W8VLK	155
I1AIV	154
W9TQL	154
W2RDK	152
W8WWU	151
HC2OT	151
SM5WI	148
W2COK	146
W2GUR	146
GM3CSM	146
W2MEL	145
OK1AW	144
TF3EA	142
W6LGD	141
W9ABA	141
W9DUY	140
W6ATO	139
W6KYV	139
I1XK	137
W7ETK	132
VK4RC	131
W6TE	131
CR9AG	131
W6WJX	131
W5CPI	130
OE3CC	128
VE7KC	127
DL1DA	127
W9NZZ	126
VR5PL	124
W6MI	124
W6NTR	123
W6MUF	123
KG6GD	121
W7BTH	120
DL3DU	118
W6NRZ	117
KL7UM	117
ZS2EC	116
W7HXG	115
W6JWL	114
W6EYC	114
KL7GG	114
W6VAT	110
W6FBC	110
W7GXA	105
W6LEV	103
W7LEE	91

38 Zones

W2HMJ	187
W2PUD	180
CM2SW	174
W8KPL	173
W8EJN	167
W8EYE	158
W2RGV	156
W2UEI	156
LU7CD	155
W2GVZ	154
W3LVJ	145
W8ZMC	143
ZS2AT	143
W0AZT	143
VE2BV	140
W9FKH	135
VE3ACS	134
W4FPK	131
W2PQJ	130
W3ZN	129
W0RBA	127
W9MZP	126
FE8AB	126
W5FFW	126
W9TB	122
GW4CX	120
W6ETJ	119
WOFET	118
W6CAE	113
KL7PJ	108
W7EYS	107
W6FXL	92
C1CH	84

37 Zones

W1KFV	168
W2ZA	160
W3WU	152
W4IWO	146
ZL3CC	143
GM2UU	142
W4ML	138
W2WC	136
W3FYS	136
W2AYJ	133
ZL3AB	131
W7HKT	130
W4DIA	129
W1APA	122
VE1EA	116
W0FWW	108

36 Zones

W4HA	151
W9WCE	136
OA4AK	128
VE1PQ	128
W3AYS	124
F8TM	124
W9LI	124
SV1RX	119
W2BF	115
W9HUZ	114
VE5JV	113
4X4BX	112
OE1FF	111
W5CD	108
W2JA	102
W5BX	99
VE8AS	93
OH3OE	85

35 Zones

W2OST	146
W1BFT	141
W4DHZ	132
W9CKP	132
W6ZZ	120
W9RQM	119
CO6AJ	119
W8AVB	119
G6QX	117
W9FNR	112
W9DGA	108
KZ5IP	108
W2HAZ	107
W0GBJ	101
ZL1QW	99
DL3AB	79
KL7CZ	66

34 Zones

W8NSS	133
W1DEP	129
W4IYT	127
W3MZE	121
W1MRP	118
W5NTT	107
W8JM	102
G2BVN	91
W9WEN	83
W8PCS	80

33 Zones

W4QN	110
W5FXN	101
W2SEI	100
W8QUS	85

PHONE ONLY

39 Zones

W6DI	192
W6VFR	172
HB9DS	164
W7HTB	161
VQ4ERR	160
VE7ZM	145
DL1FK	125

38 Zones

W2BXA	179
W4CYU	173
W9NDA	159
G8IG	155
W1HKK	153
W6KQY	149
F9BO	143
W6AM	120

PHONE ONLY

37 Zones

XE1AC	189
W1JCX	179
W9RBI	172
W3LTU	169
W8REU	163
W7MBX	158
VZ3BZ	158
G2PL	154
W6WNH	153
G3DO	153
W6PXH	153
W8BF	146
W6TT	139
W3JNN	136
E8VC	174
W7MBW	124
C1CH	83

36 Zones

W1NWO	173
W1MCW	170
W1BEQ	164
PK4DA	150
W9HB	150
W4ESP	148
W2DYR	140
W9BZB	139
GM2UU	135
W6PDB	130
W4INL	129
W1FJN	128
W8AUP	128
G6BW	127
W9HP	127
VE3BNQ	122
W0HX	120
VE7HC	120
W3DHM	96
W6SA	92
F8DC	87

35 Zones

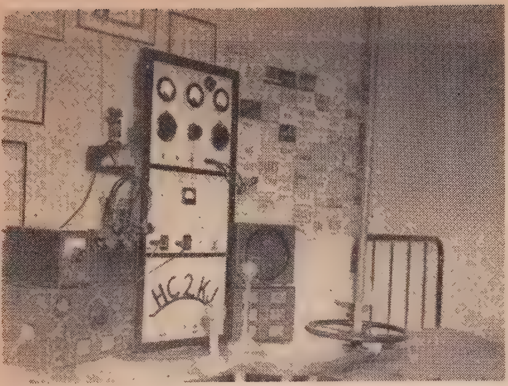
HC2JR	152
W4HA	142
W6PCK	141
W9RNX	135
W6CHV	133
W0EYR	131
HC2OT	130
W2RGV	128
W2GHV	126
W0PRZ	124
W9CKP	124
G8QX	123
W8XMC	122
CE3AB	121
W0PUE	117
W3GHD	110
W5LWV	108
W4OM	106
W3PA	105

34 Zones

LU8CW	129
W5KC	125
W2ZVS	124
W4LZM	124
W9BVX	124
W6UZX	123
W8BIQ	122
W0ANF	115
W1BPH	105
W5UIG	100
W4IWO	99
W8QBF	92

33 Zones

W5ASG	134
W9MIR	127
W5ALA	122
W9WCE	119
W2ZW	115
W8BFQ	114
W8SDR	113
W8NSS	112
VE3BQP	108
W0ANE	106
W2PQJ	100



Two microphones, no less, keep HC2KJ pretty well heard on the DX bands. The receiver is an HRO, and the steering wheel provides direct drive to the rotary beam.

letter, went to *YK1AC*. Incidentally, Lucho says YK1AC is on 28, 150 phone and always QSL's. . . . WØPNQ received a letter from a friend of his, VR2AS, who is pretty unhappy about the "air etiquette" used by W stations.

G2PL has practically retired from DX, as we know it, but is very interested in low frequency DX these days; for example, 160 meters. He wants to get the W6s on there this winter. Good old Peter! And, I knew him when. . . .

VK2ACX will be off the air for a couple of months while he builds a broad band exciter which will be piped into an 813 final. Art tells me that VK2DI has moved into a new home about a mile from his QTH, so, as he puts it, "there should be a lot of local QRM whenever a new one pops up on the band." W6RBQ adds three new ones, but relates that up to that moment, he hadn't been able to snag *FP8AC*.

The Non-Conductive Antenna

In spite of poor conditions, W4HA adds four new ones on phone; *HC8GRC, SP5AB, VR5GA*, and *3V8BB*. . . . In the May column, something was said about VK5XK. Now it comes out through W3DLI that he was using an antenna consisting of what he calls "flea-size wire." To prove it, 5XK sent a sample to 3DLI, who, in turn, sent a sample to me. All I hope is that this small number 40 piece of wire doesn't show up on my coat; otherwise, it will look like there is a redhead mixed up in the deal somewhere. (*Secretary's note: This is one gal the boss can't fool!*) (*Third man's note: I've checked it with an ohm meter and it doesn't conduct! Now what?*) Hey, who's writing this darned thing anyhow? Let's get back to DX before it's XDX. OE1CD is on the verge of being our first OE-WAZ. Wish we could tell you who he is because many of you would remember him from long ago. Conditions being as they are, he will have to remain undercover.

PY1DH comes to life with a long list of good ones proving that while we haven't heard from him in quite a while, he hasn't been asleep. He claims that he's been too busy chasing DX to write about it! Ed has plastered his walls with about every DX certificate ever awarded and suggests that we create a DXCH Club (DX Certificate Holder Club). Naturally, he expects to be top man in this organization. He also mentions a Brazilian expedition to Trinidad Island, off the east coast of Brazil. It appears next to impossible to add all of these islands to the Country List, so we don't recommend any breath holding on this one. HB9DS believes he has worked all 40 Zones on phone, the dubious one being Zone 19, and would like information on *UAØAHD*, Vladivostok. The call looks irregular to us, and at best is unknown.

W3GHD sent in his promised *phone only* list which gets him off to a nice start. Bob was one of the lucky few to land a *3A1A* QSO. As most of you probably know, *3A1A* (DL4ND) had only 48 contacts fom Monaco when he was called back to duty by a cancellation of leave. Most of these 48 contacts were with other than Ws. We understand that he hopes to return to Monaco shortly and finish his unfinished work. ON4QF's trip to Andorra is still awaiting French approval, and according to VE7HC, Mick plans to go to Paris to speed things up. We hope that he is successful, and that everyone will have PX safely stashed away by the time you read this. In this connection, we predict that ON4QF's signal from Andorra will be the first and only amateur signal ever to leave Andorra, PX1A and QSLs notwithstanding!! More on this later, we hope. VE7HC's luck seems to be holding out as usual. Gordie landed another "plum" in the form of *OY3IGO* on *phone*, for OY3IGO's first VE phone contact. 'Course Gordie can't remember, but he guesses it must have been his first OY on phone!

VE3AAZ now has a resonant rhombic, four wavelengths per side, aimed on Zone 23. No dividends as yet. DL1AT tells us that DL1FK has now worked all 40 Zones on phone only. There are four or five with this accomplishment that we know of, but so far, we have not received the necessary 40 cards from anyone. According to W7MBX, HE1JJ claims to be the first and only station to operate on phone from Liechtenstein. He uses a screen-modulated 807 with about 30 watts input to a long wire antenna, works for the Swiss FCC, and is 30 years old. Also from MBX is word that ZS9F was practically blinded and has not yet recovered his normal eyesight. This was caused by lightning striking his antenna while he was operating his rig. W7MBX has installed some new speech and modulation equipment with which he now claims that he can knock out any W6. Whoa, Bill. Any challengers here on the coast?

VK4HR would appreciate any information on methods of squeezing cards from *KC6EA*, *WØOZW/KS6* and the KJ6 gang. From what we can see here, the first two have done a rather complete job. Both have moved about considerably, however, and this may account for cards being lost. W7GBW sold out to W7NKA the first of this year, but hopes to get back on by fall. W2SHZ sounds relieved in working *OQ5RA*. In checking over his log, he found that he had called this one 151 times in the last two years! A one night case of insomnia added *ZK2AA* to his list. Great thing, insomnia. ZL1DA passes along, via W6PQT, the untimely information that *FK8AD* passed away. 1DA and his gang are building some 5 meter rigs for *FK8AB* and *ZK2AA* and suggests that the W6 six-meter gang be on the lookout for an opening in their direction.

Don't be disturbed if you hear an unusually "sappy" signal from the 6th district. This will be from W6EBG, trying to gamma-match a 66-foot poplar tree in his front yard. Gene has recently acquired a new QTH and is pondering over a

WAZ HONOR ROLL

To enter the Honor Roll, fill out one of the Zone and Country List forms which we will supply on request. Please send a stamped, self-addressed envelope.

The Honor Roll contains totals of postwar contacts only, that is, contacts made since November 15, 1945.

It is not necessary to submit combinations until you are eligible for a WAZ certificate. To be awarded a WAZ certificate, send confirmations for the 40 zones, as well as a list of them, direct to the DX editor. If a Country List has not been previously submitted, then one must accompany the WAZ certificate application. For these lists, please use one of our standard Zone and Country List forms, and it will then become our permanent record.

The Honor Roll is in two divisions; the c.w.-phone section, which gives the current total of zones and countries any station has worked while using c.w. or phone, or both; the other section contains a list of "phone only" stations. All contacts claimed in this section must be on a "phone-to-phone" basis.

All-time WAZ certificates will be issued upon presentation of proper confirmation. The Certificate will be similar to the postwar certificate, although no listing of all-time WAZ certificate holders is anticipated at this time.

simple antenna. The poplar tree seems to be the best bet at the moment. The Radio Club of Argentina furnishes us with the following information concerning their Antarctic amateurs. LU1ZA, 4ZA, 5ZA, 6ZA, 7ZA, and 8ZA are all in the South Orkney Is. LU1ZB, 2ZB and 3ZB are on Melchior Is., Palmer Peninsula, Antarctica. LU1ZC, 2ZC and 3ZC are on Deception Is., South Shetland Is. All should be QSLed via R.C.A. (Radio Club Argentina.

From the *DX'ER,* bulletin of the Northern California DX Club, we lift: *GD3ENK* is eager for W6 QSOs! Tom runs 100 watts to a 20-meter open-ended rhombic, and an HRO rx. *ZD8B* has left and is on his way to VK land. The VU QSL Bureau will not accept nor forward cards for AP stations. All cards for Pakistan should be sent *via AP5B only. FD3RG* is reported by the R.E.F. to be active on 14 and 28 mc and *FL8AD* on 7 mc. (Has anyone heard him?)

W4AZK, who has been producing cards from *FM8AD,* has more dope on this subject. Dave says he has all of FM8AD's log for 1950, through July 4th, 1950, except the part covering the 1950 DX contest. This contest log has been promised time and again, but as yet has not appeared. If you need this card, send Dave a QSL for any contact except during the 1950 contest. He has logs for the *1949* contest, so perhaps a little digging in your log will help you *FM7WF* tells Dave that *FM7WE* has returned to France, leaving only *FM7WF* and *FM8AD.*

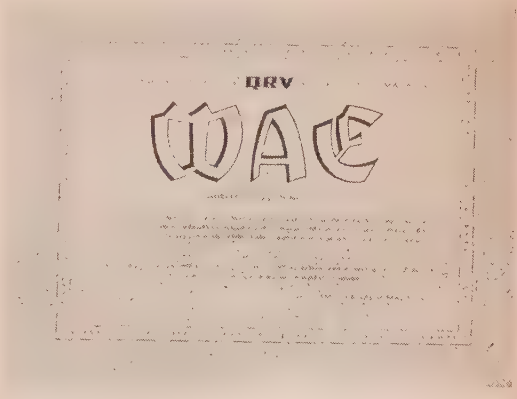
Some of you appear to be a bit mixed up on the Caroline Islands, KC6, situation. Here's a little tip that should clear it up for all. The Caroline Is. group actually includes Palau Is., and such is recognized by our government in issuing call letters. Palau Is. are at the west end of the group, and Truk, etc. at the east end. For this reason the KC6 stations on Palau have call letters starting with KC6W- to indicate "Western Carolines," and those on Truk, etc. are KC6E- to indicate "Eastern Carolines." Therefore, any Palau Is. station will have a KC6W- call, and for the time being, at least, any Caroline Is. station will have a KC6E- call. Simple? It might be even simpler to remove Palau from the list. Fortunately, ham radio is usually done the hard way, so don't worry!

New Award Available

The German radio magazine, *QRV,* is offering an attractive certificate WAE (Worked All Europe). The award of this certificate will be based on a *minumum* of 100 points, all on c.w. or all on phone. Points may be claimed, with QSL proof, as follows: There are 56 European countries and islands plus Saar, EZ. One point will be allowed for a QSO with one of these on each band of 30 mc or lower. Two points will be allowed for contacts on bands above 30 mc. The 27- and 30-mc bands are grouped together as one for this purpose. Contacts with German nationals, DL1, 3, 6 and 7, and Occupation personnel, DL2, 4, and 5, will count as two points. Only contacts on and after December 1949 will be accepted. Certificates will bear serial numbers, name, call letters and number of points proven. Scores will be published in *QRV.* Each QSL or other form of confirmation submitted, shall include the calls of both stations, frequency band, date of contact and type of operation, i.e. phone or c.w. A list of this same information, to be retained by *QRV,* shall accompany the cards, as well as three international reply coupons to help defray postage. Mail to *QRV,* Box 585, Stuttgart, Germany.

If this months column seems a bit more confused than usual it is not surprising. Why? Well, in the first place I had to run out of town for a sales meeting and didn't get to finish the column before I left. Then my infrequently mentioned "overpaid" secretary has had a rather balmy atmosphere about her of late . . . all due to the rigors preparatory to getting married next month. You see, in one way, Betty is a sort of a behind-the-scenes member of the DX Committee. She's been punching out this column from her shorthand notes for nigh onto four years now. My ol' digits got rusty long ago and can't pound the mill too well although at the moment

(Continued on page 58)



Here's the new "Worked All Europe" award, described above. Certificate Number 1 has been awarded to W2IOP.

The YL's Frequency

Conducted by LOUISA B. SANDO, W7OOH/1*

It's always fun to hear that a celebrity has joined the ranks of our hobby. For us YLs it's even more interesting to learn that his XYL has become a ham, too. We're talking about band leader Tex Beneke, W2CKD, and his XYL Marguerite, who recently became W2EHR, as reported here a couple of months ago.

As with many XYLs, it took Marguerite quite a while to feel the "bite." In fact, she started out with quite an opposite reaction. "Do you know what I actually thought of ham radio and everybody connected with it at first?" she asked. "I came to detest, abhor, despise and hate the mere thought of it! Oh, my goodness, what I didn't say about ham radio!! That code machine going all day and half the night for months almost drove me insane! That old S-38 receiver that Tex carted around the country to 'read the mail' with was always going and I couldn't have my radio or television programs on without disturbing him. I *had* to listen to amateur radio and promptly came to the conclusion that everybody with a ham license was a jerk. That gives you a general idea of my opinion of ham radio in the beginning and what my poor guy had to put up with while trying to get his ticket!

"After a year of grabbing what few minutes he could daily to study, Tex gave the orchestra a 10-day vacation and, while everyone else in the band enjoyed himself, he shut himself (and *me*) up in our very small hot New York apartment and spent almost 24 hours a day cramming to take that exam. Both our tempers were completely shot by the end of that time—and when the day finally came that he did go down to take the exam I don't know which of us was more delighted!

"Now for a whole year we had been lugging around a rig in the back end of the car—all over the United States. W4YA, Clyde Lucas and his MYL, Gypsy, down in Miami, had given Tex the 'bug' and got him started; therefore I really blamed them somewhat for my state of nerves! (Apologies to both you wonderful people!) When the license was safely in Tex's hands the time had finally arrived to get out the rig and get on the air. Nothing happened! He called, I called—we answered everybody—no luck! After about a week of this we found ourselves in a hotel out in Hollywood—with the license, the rig, but not getting out. I mingled tears of exasperation and rage along with my long loud CQs because nobody would talk to us. Then the miracle happened—some of the locals did hear us and came to the rescue. They helped us get on the air, brought every conceivable piece of gear needed—W6EAL even brought over a tiny beam. W6CTY, 6YIY, 6ZRZ, 6GAI and 6RIA all contributed generously to helping W2CKD get on the air—and so help me, after meeting so many wonderful hams, reading the mail on 10 meters nightly, I had a complete change of heart! I suddenly had an understanding of a brand new world that this new hobby of my guy's had opened—and what it could really mean to a person like myself, who frankly needed a hobby badly to counter-balance this hectic and superficial life we live in. I became a complete convert!

"Fran Thompson, W6GAI, was simply wonderful. She heard that we were in town and called me many times, came after me often and let me see how her rig worked, and let me talk to people all over the country from her station. She was a great source of encouragement to me inasmuch as she also had had to 'dig' to get that ticket. I found that nothing was too much trouble for any ham to do to help another—which frankly amazed me!

"I worked hard trying to master that darned theory—the code was just a matter of practice for it came very easy to me. Everyone on 10 meters that we contacted encouraged me—and I do love to talk—so now I have found a wonderful outlet for this big mouth of mine! I took the exam in Chicago while Tex made some recordings and kept right on studying in case I had to make a repeat appearance in 30 days! I need not add that W2CKD is one of the happiest OMs in the world that W2EHR shares his rig after a complete *about face!* I am far worse than he about having the rig hot at all times—it's never too much trouble to unpack it and get it going. I don't mind how much room it takes up—I just leave another hatbox home!

(*Continued on page 50*)

Marguerite, W2EHR, at the operating position.

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* *Address L. B. Sando, c/o CQ Magazine, 342 Madison Ave., New York 17, N. Y.*

ELDICO'S ANTENNASCOPE

TAKES THE GUESSWORK OUT OF ANTENNA PERFORMANCE

At last you can be positive of having maximum antenna performance and efficiency with the new Eldico Antennascope based on the design appearing in September CQ. The Antennascope is an impedance measuring meter used in conjunction with any grid dip oscillator. With the Eldico Antennascope you can measure—

- Radiation resistance of your antenna
- Resonant frequency of your antenna
- Impedance of your transmission line
- Input impedance of your receiver
- Standing-wave ratio on your feedline

The guess work is out of antenna performance! Whether you are running flea power or a west coast kilowatt it is axiomatic that for maximum performance of your rig you have to get the power into your antenna. Meters in the transmitter circuit give an accurate measure of performance, but there just hasn't been a simple surefire way to measure antenna performance. Now that's changed!

You can determine, for certain, whether you should be using 52-ohm or 72-ohm coax; whether your folded dipole is taking the load or its all in a resonant feeder; whether the power is going into the antenna where it belongs! You can get vastly improved receiver performance by properly matching a receiving antenna to the input and the Antennascope will give you this information. You can cut down your standing-wave ratio by proper antenna adjustment, adjustments made simple because the Antennascope will give you the necessary information accurately and rapidly. You can materially reduce TVI and BCI by guaranteeing yourself cold feeders —with the Antennascope the r. f. can be poured into the skywire where it belongs.

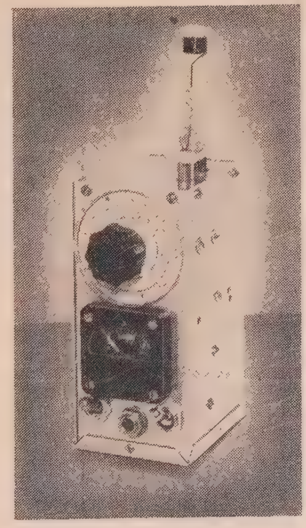
Whether your antenna is the old reliable Zepp or a stacked 20-meter giant, the Antennascope will be an investment well made. It is the kind of instrument that will become as important around your shack as the neon glow lamp and the volt-ohmmeter. Best of all, you can have all the benefits of this ingenious measuring instrument for as little as $.   dollars. Eldico's Antennascope may be purchased in several forms:

Antennascope kit, including everything required, meter case, full detailed instructions . . . . $.

Antennascope, complete ready to operate . . . .

If your local distributor can't supply you, order directly from Eldico. Order promptly because the supply of kits and finished units is limited. Orders will be filled in order of receipt.

ELDICO'S GRID DIPPER



One of the most valuable pieces of test and measuring equipment in the ham's shack the GDO's value is now greater than ever when used with the Eldico Antennascope. New improved model incorporates high-sensitivity regeneration circuit. This instrument enables you to locate resonant circuits for pre-tuning or de-bugging without applying power to the rig or receiver; it measures harmonics, may be used as a signal generator; and performs numerous other measuring functions. It is a tremendous time saver to all experimenters. Grid Dipper kit includes everything required, special case designed to facilitate one-hand operation, tube, internal power supply, meter and full detailed instruction book covering assembly and applications. Range 3 mc to 250 mc covered in six steps. Operation from 105-125 volts, 50 60 cycles a.c. $24.50

Grid Dipper Modification Kit. Modification kit, including instructions to convert original Grid-Dip oscillator kits to improved version with regeneration as described above . . $3.00

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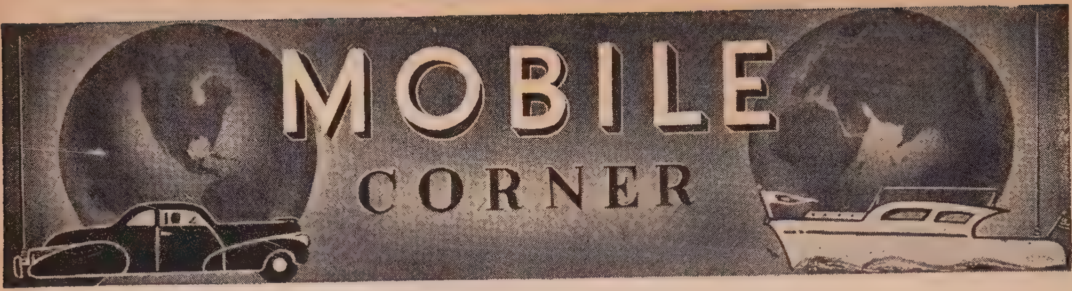


MOBILE CORNER

Conducted by RALPH V. ANDERSON, W3NL*

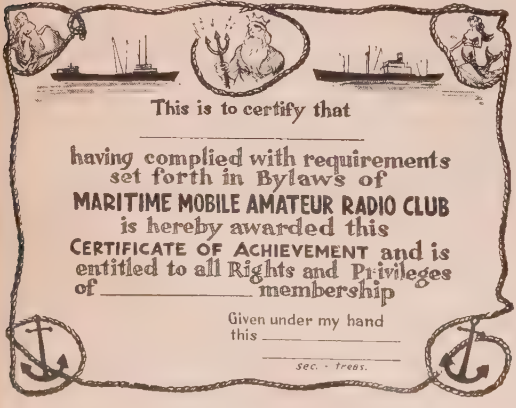
THE TWENTY AND SEVENTY-FIVE BOYS are really making good use of the regulation permitting mobile operation on these bands since ten has gone sour for the summer. Ten continues to be employed for most local activities, such as emergency drills and get-togethers. Twenty is a wonderful band for mobile DX, some of the mobile operators are surpassing a great many fixed stations in countries worked.

Maritime Mobile Amateur Radio Club

The MM gang, being confined to the ten meter band is experiencing an operating slump since the band is not often open. It has been reported that the Korean situation may affect MM operation on vessels employed by the U. S. Government.

The election of officers has been completed with the incumbents being carried over another year—W6YYT Commodore, W5AXI Vice-Commodore.

The MM Club Certificate is a five-color affair and is really an eye catcher. The certificate is issued to any amateur station sending in 30 MM QSL cards to W3NL—your cards will be returned by registered mail. Certificates have been issued to W8DQO, W8SU, W4LSX, W4OB, W2QHH, W9GGV, OZ5BB and W6LYG. A ham station aboard a vessel is not Maritime-Mobile unless beyond the three-mile limit; cards will be counted as MM contacts even though the vessel is within the three-mile limit, but still in coastal waters.



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having complied with requirements set forth in Bylaws of

MARITIME MOBILE AMATEUR RADIO CLUB

is hereby awarded this

CERTIFICATE OF ACHIEVEMENT and is entitled to all Rights and Privileges of ______________ membership

Given under my hand this ______________

______________ sec. - treas.

The new Maritime Mobile Club Certificate.

It has been reported that Capt. Bill (W6MT) is a prisoner of the Reds in China. W5OCN is closing down. W5KTL, fixed MM control station is silent while Eddie's in the hospital; other fixed MM control stations are taking over for him.

29.640 Calling Frequency

Reports are being received from mobile clubs which have adopted 29.640 as a calling frequency. The Ak-Sar-Ben Radio Club of Omaha, Nebraska and the Rochester Mobile Club (N. Y.) have adopted this frequency. A note from Denver indicates that this club will soon be using this frequency. This editor would like to hear from mobile clubs regarding the club frequency.

Mobile Power Supply

W3CDL and W3MNR of the Washington Mobile Club have recently completed a paper on Mobile Power Supply. A copy can be obtained by sending a self-addressed stamped envelop to either of these fellows.

New Converter

A new converter tuning 80, 40, 20, 11–10 with full bandspread has been announced. Preliminary tests have shown this converter is very efficient. A noise limiter is available which may be secured to the rear frame of the converter.

The Chicagoland Mobile Radio Club

The Chicagoland Mobile Radio Club was organized four years ago. Membership totals about 250, 200 of which are in the Chicago area. Officers are W9FJO, President; W9MRK, Vice-President; W9ITO, Secretary; and W9SXJ, Treasurer. Meetings are held the last Tuesday of each month at the Gold Dome Building in Garfield Park. Although emergency communications is the primary purpose, a great deal of activity lately has been the radio control of parades—communication is furnished for the parade from beginning to end plus all incidentals such as ambulance calls, etc. The main frequency is 29.640; several use a secondary frequency of 29.585. Most of the activity is on ten, with a scattered few on 20 and quite a number on 75. Wide band FM on 147.5 (fixed channel) complete with squelch is used by about 15 units, but mostly in connection with the ten-meter units, especially at parade functions. Some

(*Continued on page 50*)

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* *Send contributions to R. V. Anderson, 2509 32nd St., S.E., Washington 20, D. C.*

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BC-221 FREQUENCY METER

These won't last long so order now for one of these famous freq. meters. They are just like new with original calibration charts. Range 125-20,000 kc. with crystal check points in all ranges. Complete with crystal and tubes.

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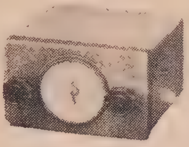
3-30 Gon-Set Converter; 10-11 Gon-Set Converter; 20 meter Gon-Set Converter; 75 meter Gon-Set Converter. *Shpg. Wt. each 4½ lbs. each,* **$39.95**



Gon-Set Noise Clipper, *Wt. ½ lb.* **$8.25**

NEW Gon-Set Tri-Band Converter **$42.50**

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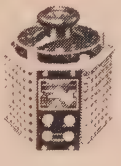

Smooth, efficient, voltage control, 0-135 volts output from 115 volt AC line. Models also for 230 volt input. Write for free literature. Models for table and panel mounting.

Type 20, 3 amp	$12.50
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116U, 7.5 amps, panel mtg.	18.00
1126, 15 amps	46.00
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NEW COLLINS 75A-2

Double-conversion superhet with sensational stability, calibration accuracy and sensitivity . . . all the good features of the 75A-1, plus many new ones. Get your order in now for September delivery. Price, complete with tubes **$420.00;** matching 10-inch speaker **$20.00.**

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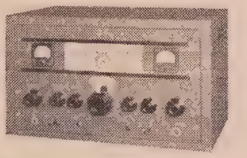
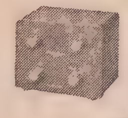
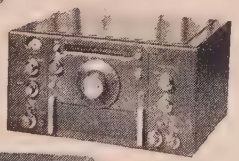
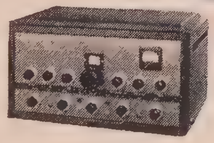




SELECT-O-JECT $24.95

HRO-50 $335.00





JOHNSON VIKING KIT $209.00

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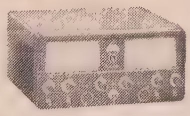

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Eldico TVT-62 low-pass filter, kit	**$7.99**
Wired and tested	**$10.99**
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Copper mesh shielding, 36" wide, min. order 6 sq. ft., per sq. ft. plus $.50 per order for packing.	**$.85**
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TR-75 transmitter kit	**$34.95**
MD-40, 40-watt modulator kit	**$29.95**
MD-40-P, same with power supply	**$39.95**
MD-100, 100-watt mod. kit	**$44.95**
Wired and tested	**$54.95**

ELDICO HIGH VOLTAGE POWER SUPPLY KITS

Kit No.	Output	Price	Transformer only
HV-1500	1500 v. 350 ma.	$29.50	$19.50
HV-2000	2000 v. 500 ma.	69.50	39.50
HV-2000SP	2000 v. 700 ma.	89.95	49.95
HV-2500	2500 v. 500 ma.	99.95	69.95

Electronic Bug, automatic dots and dashes:

EE-1, kit form	**$21.95**
Wired and tested	**$27.95**
EE-2, with integral monitor, Kit form	**$29.95**
Wired and tested	**$39.95**

Learn code . . or speed up with the Gardiner Automatic Sender, Type S **$24.00**

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The Monitoring Post

gleaned by **THE BRASSPOUNDER***

ALL EARS ARE TO THE GROUND with the announcement of Civil Defense units being established throughout the nation, and the ham is wondering just what part he will play in the set-up. Such organizations demand communications. Communications are as important to civil defense as to the Army and Navy. Normal facilities will be employed at the outset, as in World War II, with the ham tagging along at a later date, probably when radio gear is impossible to beg, borrow, or steal, and then the call will come for amateur radio to take its place to parallel vital communications lines; to equip stations with emergency power and to be ready at a moment's notice to supply anything from walkie-talkie and handy-talkie stations to fixed stations capable of spanning thousands of miles with a limit of 25 watts to the final. When the entire Civil Defense organization begins to run smoothly, someone will realize that an occasion may arise when, due to natural disaster or enemy action, amateur radio can play an important part and will be asked to organize overnight, supplying equipment and personnel, operating on frequencies that will be new to the majority of hams.

It will be mentioned that the ham fraternity excels in ingenuity and can do about anything with radio gear that is asked of them. Hams have shown the way in radio communications since the beginning of wireless. However, the ham didn't come up with 1,000-mile QSOs on 144 mc with the advent of the Fleming valve and the outlawing of the old spark rig. It took time, and plenty of it, as well as plenty of money and energy. It makes us wonder why amateur radio is not given the same break as the other branches of civil defense work. Because of the disaster occasioned by the 1944 hurricane which hit New York City when the War Emergency Radio Service took over a great portion of local communications, ham radio has been recognized there and is included in the civil defense organization now being established. It is hoped that other cities and communities will follow the lead.

W2KTW surveyed the antenna pole atop his garage with a view to replacing it with a rotary, but found the top section beyond his reach. A few days later a neighborly woodpecker was seen and heard doing its best to bring down the unwanted pole; a little patience and more assistance from the bird will solve KTW's problem. . . . **KZ5AB,** famous for his handling of Ecuador earthquake traffic, is now stationed at Washington, D. C. . . . **W4NBA** has been selected NCS for the coming season in the VFN (Va Fone Net) on 3880 kc. . . . **W7IOQ** keeps a good emergency organization going in the Everett, Wash. area, and is an amateur astronomer of outstanding ability as well.

The Scott Air Base ARC had 15 officers and men in the field, along with considerable gear, working with the St. Clair Country ARC during the June national emergency test. . . . **W4NNN** came out on top in the First Annual Virginia QSO Party, contacting 75 stations, with **W4IA** runner up with 65 QSOs. The prize-winners, in addition to NNN and IA, are **FV, PYN, CVO,** and **KVM.** . . . **W3QIR** has been transferred from K4WAR to Carlisle Barracks and must get along without any hamming, for there isn't any rig at the new post. . . . *Hams in TV* in and around the Detroit area is sponsored by the Detroit Amateur Television Assn. and the Lawrence Tech Television Society. The two groups are working toward ham TV nets and hope to have a good start by next winter.

In keeping with the item appearing in this column in the June issue, **W4KFT**'s suggestion that "good signals" be recognized in some manner, we can report a few good signals heard recently. They are: **W1AYC, EOB, W2MCE, BGG, CBO, EQD, W3OLP, W4ERP, VP, KFC, W5BRS, W6WDH, WQC, LVN, W7EOB, W8ROX, W9HQZ, EAM, UIT, HEL, MXP, JLL, W0SBI, VTN.** . . . The Atlanta RC members enjoyed a demonstration of the Army's "Snooperscope" at a recent meeting. This device permits the user to see in the dark by means of infra-red rays. The electronic conversion of infra-red light to visible light and the 4,250-volt power supply created great interest when described by club Prexy **W4HDC.** . . . **W9HHX,** Milwaukee School of Engineering ARC, contacted 225 stations during the field day tests. . . . **W8WXV** and **W5VY** established what may prove a new record on 2 meters when on June 24 their QSO spanned 1,200 miles. **W5ONS** and **W7QLZ** also took advantage of the opening up of 2; many other unreported QSOs made June 25 a memorable date on the very high freqs. . . . On June 27 the 6-meter band came in for its share of DX when all U. S. districts and VE1 and VE2 were heard in Ohio.

W2BYF was a contestant in the Class C event of of the outboard motorboat races on Long Island Sound on July 16, where a host of maritime mobile and mobile rigs were set up for operation; at the yacht club **W1SGZ/1** was control with **W1DBM**

(*Continued on page 50*)

Here's one that's familiar to those of us who work 75, 20, or 10—the operating position at W0ARA, with OM Bob, himself, at the mike.

---

* *Address correspondence to: The Brasspounder, c/o CQ Magazine, 342 Madison Ave., N. Y. 17, N. Y.*

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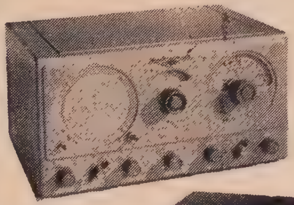

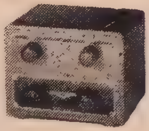

A sensitive bandswitching receiver complete with speaker & power supply in one cabinet. Unusual selectivity achieved with the addition of the Select-O-Ject. A superb receiver for the beginner.

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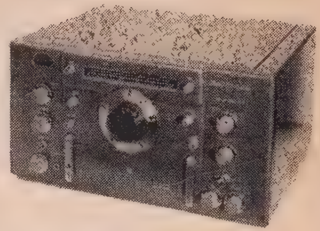

Built-in power supply on separate chassis. Front panel oscillator compensation control. 20 to 1 precision gear drive. Provisions for NBFM adapter. Push-pull audio output. Speaker matching transformer built into receiver with 8 and 500/600 ohm output terminals. Packed with important new features.

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HRO—TS, 10" PM Speaker in matching cabinet $14.00

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YL's FREQUENCY

(from page 44)

"We are mobile and portable—we have a Collins MBF, Navy surplus converted to 10 by 6YIY, R-9er, Lysco VFO, 300-ohm folded dipole (hung out any hotel window, and on the roof if possible). The little rig is very portable—transmitter and receiver built on one chassis and even with only 3 watts input we manage to work out fine when conditions are favorable. Most of our contacts are made from the mobile rig, however, due to the fact that we do travel almost daily. Until we settle down in a permanent QTH, I wonder if we are entitled to MOBILE WAS? We are definitely working for it the hard way, right in each state's backyard! The one good thing about running over the countryside is that we can visit with our contacts and if the QSL cards don't come when they are due, we can just ring the doorbells and pick them up ourselves!"

Incidentally, Marguerite adds that her former friends and family now have the very same opinion of *her* and ham radio that she had of Tex and ham radio in the beginning! Well, at least W2EHR and W2CKD are happy!

YL Clubs

Both YL clubs in California have recently held election of officers. For the San Diego YLRL the new president is W6IGP, Carole Hiebert; vice president, W6BGC, Leone Simon; secretary, Alma Wineteer, and treasurer, Ruth Childs; both of the latter two are awaiting their calls.

Taking over for the Los Angeles YLRL is W6CBA, Violet Sasse, president; W6YZU, Naomi Turk, secretary; and W6EHA, Genevieve Malette, treasurer.

Last two appointments for D/C in National YLRL have now been made. The second district will be represented by W2RTZ, Hope Plummer, 785 Park Ave., New York City, and the ninth by W9JTX, Louise Beringer, 2301 N. Forest Brook Rd., South Bend, Indiana. While we're speaking of D/Cs, congratulations to W1RTB, Nell Waterman, and her OM on the birth of a jr. op.

Here and There

From Maude, VE6MP, we hear that she has recently received a Public Service Certificate from the ARRL for meritorious work in connection with the blizzard in 1948. "It was a big surprise coming at this time," says Maude. "I also have a certificate making me an honorary member of the 49ers in California for public service rendered, but to date I have been unable to find out anything about this club, but the fellow who sent it said 'you are a lucky gal.'" Anyone have the answer? Maude and her OM have a new 20-meter beam up and are also happy over a Collins 32V1.

In the middle of July we had the pleasure of dropping in on W1BFT and W1FTJ, Carl and Dot Evans, in Concord, not far from our summer QTH. A popular gal Dot; the day before our visit both W1MWI, Eleanor Blake, and W1MUW, Norma Moskey, had stopped in to see W1FTJ. After going all out for Field Day, Dot and Carl are now temporarily QRT while major additions are being made to their home. W1BFT kindly lent us his little "Susie-Q" rig for the remainder of the summer and we're looking forward to some QSOs. Dot and Carl also took us to the state police radio station where W1APK, who organized and manages it, showed us their very complete setup. A red-letter day in this workaday world!

Off again

By the time you read this W7OOH and OM will be heading West again—much to our delight! The route will be via northern New York State, Ontario, Chicago and St. Louis and, again, we're looking forward to personal QSOs with as many of you YLs along the way as possible.

MOBILE CORNER

(from page 46)

time ago the planning group of the club set forth a very ambitious plan for covering a 100-mile circle centered on Chicago and this plan is fast being completed. About 50 fixed stations will have fixed frequency receivers on 29.640. Other non-mobile clubs in the area are offering full coöperation and their members are also installing fixed frequency receivers. The club is actively associated with the local emergency group, having complete representation with the Amateur Emergency Corps, an organization headed by W9MDO and W9LLX. Hams visiting Chicago are invited to open up on 29.640, a great many QSOs are assured.

THE MONITORING POST

(from page 48)

managing the project for the Norwalk Red Cross RC. The race, scheduled to go a 55-mile course, was well covered by /MM stations, but bad weather caused the racing committee to change plans in favor of short races over a harbor course. Spotted around the course were Maritime Mobiles **W1PEA, KGE, PHB, DBM,** and **W8YED/1** on 75, with another circuit on 10 of both maritime mobiles and mobiles including **W1QOO** and **DXL** in boats, and **W1PQU, PKL, HON, UJB,** and **QBO** spotted at vantage points with their mobiles. Complete coverage was maintained for six hours, during which many spills took place caused by rough waters. All hands did a swell job.

During a news broadcast was heard the following item: "Allied headquarters in Korea today announced they had to rely upon 'amateur radio hams' for communications at the outset of the Korean fighting." An extremely startling announcement, and one that took but about five seconds of the news broadcast time—it came as a complete surprise to the listener. In fact, it came so fast the BC receiver had to be turned off so the listener could concentrate on what had been said and to realize that credit was being given to "amateur radio hams". Too seldom is ham radio credited with anything other than TVI and BCI. Efforts will be made to get a more complete report than that which appears above.

Good News For Hams!

these are extra savings we're passing on to you as a result of purchasing the entire stock of a distributor who went out of business!

CRYSTALS Low Freq.

FT-241 A holder ½" pin spacing, for ham and general use, XTAL control. Signal Generator, marked Army Mc. harmonic frequencies—Directions for deriving fundamental frequencies enclosed. Listed below by fundamental frequency, fractions omitted.

412 413 414 415 416 418 419 420 422 423 424 425
426 427 429 431 433 434 435 436 437 438 440 441
442 443 444 445 446 447 448 462 468 472 473 474
475 477 479 481 483 484 485 487 488 490 491 492
493 494 495 496 497 498 503
504 506 507 508 509 511 515
516 518 519 522

each **49¢**
10 for $4.50

372 374 375 376 377 379 380
381 383 384 386 387 388

each **39¢**

390 391 392 393 394 395 396 397 400
401 402 403 404 405 408 409 411

each **79¢**

450 452.777 461.111 464.815 465.277 526.388 529.166 530.555
531.944 533.333 536.111 537.500 538.888

each **99¢**

Frequency Standard
98.356 kc
3-pr. holder
$3.98

Special 200 kc. Xtals without holders 21-32" space x 23-32"

69¢ each
3 for $2.00

HAM CRYSTALS

FT-243 holders—½" pin spacing, for ham and experimental use, fractions omitted.

4190 5030 5485 6006 6040 6073 6075 6100 6106 6140
6173 6206 6208 6773 6840 6873 6906 6973 7740 7773
7806 7840 7873 7906 7925 7973 8240 8273 8306

each **49c**
10 for $4.50

3735 5305 5677 5700 5706 5740 5750 5760 5773 5775 5803 5825 5840
5850 5873 5875 5900 5906 5925 5940 5973 5975 6273 6340 6373 6406
6425 6440 6450 6473 6475 6506 6540 6573 6606 6640 6673 6705 6740
6806 7306 7340 7373 7406 7440 7473 7506 7540
7573 7640 7673 7706 7806 8173 8340

each **99c**
10 for $9.00

SCR-522 XTALS

5910 6370 6450 6470 6407.9 6522.9 6547.9
6610 6750 7480
7580 7810 7930

each **$1.29**

BC-610 XTALS

2 Banana Plugs ¾" spc.

2045 2105 2125 2145 2155 2220 2258
2260 2282 2300 2305 2320 2360 2390
2415 2435 2442 2532 2545 2557 3202
3215 3237 3250 3322 3510 3520 3550
3570 3580 3945 3955 3995

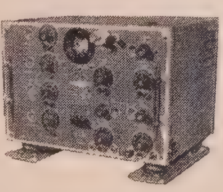
each **$1.29**

Payments must accompany order. Enclose 20¢ for postage and handling. Minimum order $2.00 plus postage. Crystals shipped packed in cloth bags inasmuch as they are shock mounted. All shipments guaranteed.

High Voltage Triplett DC. Voltmeters—125 Ohms per Volt—With External Multiplier—Brand New!

VOLTS	2" PRICE	3" PRICE
600	$2.95	$3.95
1000	3.49	4.49
1500	3.49	4.49
2000	....	4.49

REDUCED FOR CLEARANCE
Bendix 100 Watt Transmitter



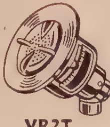
Constructed of the highest quality precision parts! 4 separate ECO's with tubes, 3-807, 4-12SK7. Complete instructions for converting to 10, 20, 40 and 80 meters supplied. Dimensions 11 x 12 x 15", weight 35½ lbs. Only a few left at this low price!

$29.95 Like New | **$19.95** Used

Low-Impedence Dynamic Mikes—All New—Boxed

AMERICAN MIKE—200 OHMS

VR-2T — $42.15 list — Now $16.86
D-7T — $27.00 list — Now $10.80
D-220T — $71.00 list — Now $28.40



VR2T

D7T

D-220T

UNIVERSAL MIKE

D20A—35-50 OHMS
List $32.50
Now **13.00**
D20C—500 OHMS
List $32.50
Now **13.00**
D-20A—D-20C

Famous Make Butterfly Condensers All New—At 1/3 off Regular Net Prices. Not Many Left.

.500 GAP		.375 GAP		.250 GAP	
77	$19.20	11	$ 8.15	13	$ 7.95
87	20.65	45	12.90	95	15.40
96	22.15	82	17.20	111	16.80
105	23.80	106	20.15	127	18.25
115	25.20	130	21.60	143	19.85
124	26.65	141	24.50	159	21.00
		153	25.95	175	22.50
				192	23.95
				208	25.95

Note: figure in left column is max. cap. per section

Nationally Known Famous Make Heavy Duty Single & Double Stator Transmitting Condensers.

MAX. CAP.	GAP	PRICE	MAX. CAP.	GAP	PRICE
300	.077	$ 5.32	200-200	.077	$ 6.58
230	.171	5.57	100-100	.219	14.11
500	.219	17.22	60- 60	.249	6.27
250	.219	12.85	60- 60	.344	13.41
75	.344	8.96	100-100	.344	15.64
245	.344	14.11	60- 60	.469	14.11
50	.359	3.89	30- 30	.719	12.99
50	.469	7.05			
100	.469	11.62			
150	.469	12.95			
75	.719	12.85			

Ham Transformers New Boxed Peerless Hi-Quality—Not Surplus at 60% Off List Prices.

Modulation Trans., 300 Watt Universal, Model M-2107T, List $70.00, Reduced to **$28.00.**

Driver Trans., 15 Watt Universal—70MA Primary. Model A4237Q, List $10.75, Reduced to **$4.30.**

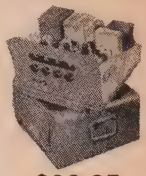
Plate Trans., 2428V-CT 300 MA, Model P5196A, List $45.00, Reduced to **$18.00.**

Filament Trans., 2.5 VCT—20 AMP—4500 V Ins., Model F8513V, List $8.00, Reduced to **$3.20.**

CLEARANCE
OF ALL SURPLUS!

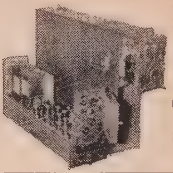
Only a few of each item left . . . hurry, hurry, hurry for the best buvs and biggest savings!

RADAR RECEIVER BC-1068A



Used. Good Consition. Covers 150-210 MC. Can be converted to TV Receiver or a Hot 2 Meter ham receiver. Has 2 RF stages, detector & oscillator. Each individually tuned, 5-10 MC. I.F. Stages, 2nd Detector & Video AMP with 110 V AC 60 Cycle Power Supply. **$39.95**

WAVEMETER BC-1073A



Used. Good Condition. Covers 150-210 MC. Companion to BC 1068A receiver. Contains resonant cavity wavemeter, oscillator, heterodyne amplifier, tuning eye, with 19 tubes—8-6SN7GT, 1-6SV7.1—6SA7, 2—6V6GT. 2—6H6, 1—5Y3GT, 1—9002, 1—9006, 1—6US, 1—6SF5. 110V-AC 60 Cycle Power Supply. **$14.95**

RADAR TRANSMITTER BC-1072A

Used. Good condition. Covers 150-210 mc. Contains many parts, such as 110V AC Blower. Gen. Radio—1 AMP variac, kilovolt meter, circuit breaker, 110 volt HI & LO voltage power supply, tubes, oil condensers, and many others. Companion to 1073A. Operates from 110 V AC 60 Cycles. **$19.95**

Special Package
1—BC 1068A
1—BC 1073A
1—BC 1072A

All Three for **$69.95**

BC-645UHF RECEIVER TRANSMITTER

"The Citizen's Radio" covers 420-450 mc. Consists of complete transmitter, modulator system and receiver, 15 tubes, and simple complete conversion instructions for Citizen band operation. Brand new **$14.95**

OHM METER Weston 689

A beautiful instrument for accurate work. Scale 0-10 ohm and 0-1000 ohm scaled to read 1/20 of an ohm with ease. This 2¼" round meter is housed in a black bakelite case 1¾" x 5". Complete with heavy duty felt-lined leather case and lock.

Brand new **$9.95**

SUN RADIO
OF WASHINGTON, D. C.
938 F STREET, N. W. WASH. 4, D. C.

TERMS: All items F.O.B. Washington, D. C. All orders $30.00 or less, cash with order. Above $30.00, 25 percent with order, balance C.O.D. Foreign orders cash with orders, plus exchange rate.

Esse's Special Offer!

MALLORY

POWER WIRE-WOUND RESISTORS

Below is offered a fine assortment of fixed and adjustable types of high-grade vitreous enamel resistors of assorted wattages and ratings. This is one of the greatest surplus offers that Esse has ever offered and should be of tremendous interest to anyone interested in resistors. In most of these resistors, our quantity is substantial to take care of all orders although the prices that we are offering these for should create such an interest that our sales will probably be tremendous.

These resistors are strictly first class merchandise, are brand new and full of life. They are not out-dated or old. We will sell these with the absolute guarantee that you must be completely satisfied in every way or you may return them for full refund and, on these resistors, **if you are not satisfied,** we will even pay any transportation charges that you have been out at the time we make refund. We know that these are "tops". We also know that the prices we are quoting herein will be far far less than you could buy them elsewhere.

10 WATT—ADJUSTABLE VITREOUS ENAMEL RESISTORS—TUBE SIZE 5/16" x 1¾"

Catalog No.	Wattages	Resistance Ohms	Current Milliamperes	Price
101	10	1	3150	**13¢**
102	10	5	1400	**13¢**
103	10	15	812	**13¢**
104	10	75	360	**13¢**
105	10	150	260	**13¢**
106	10	250	250	**13¢**
107	10	800	112	**13¢**
108	10	1500	81	**13¢**
109	10	2250	66.5	**13¢**
110	10	3000	56	**13¢**
111	10	3500	53	**13¢**
112	10	6000	40	**13¢**
113	10	7500	36	**13¢**
114	10	9000	33	**13¢**

10 WATT—FIXED VITREOUS ENAMEL RESISTORS—TUBE SIZE 5/16" x 1¾"

Catalog No.	Wattages	Resistance Ohms	Current Milliamperes	Price
115	10	2	2200	**10¢**
116	10	3	1800	**10¢**
117	10	4	1580	**10¢**
118	10	7.5	1150	**10¢**
119	10	12	910	**10¢**
120	10	20	707	**10¢**
121	10	50	447	**10¢**
122	10	150	260	**10¢**
123	10	200	220	**10¢**
124	10	450	150	**10¢**
125	10	700	120	**10¢**
126	10	1000	100	**10¢**
127	10	750	115	**10¢**
128	10	1100	95	**10¢**
129	10	1500	81	**10¢**
131	10	3000	56	**10¢**
133	10	6000	40	**10¢**
134	10	7000	38	**10¢**
135	10	8000	35	**10¢**
136	10	10000	31.6	**10¢**
137	10	11000	30	**10¢**
138	10	12500	28	**10¢**
139	10	13500	26	**10¢**
140	10	15000	23	**10¢**
141	10	16000	22	**10¢**
142	10	25000	14	**10¢**
143	10	30000	11.5	**10¢**
144	10	35000	10.5	**10¢**
145	10	45000	9.5	**10¢**

ATTENTION: If you purchase any assortment of these resistors in total amounts to exceed $100.00, deduct 20%.

20 WATT—FIXED VITREOUS ENAMEL RESISTORS—TUBE SIZE ½" x 2"

Catalog No.	Wattages	Resistance Ohms	Current Milliamperes	Price
147	20	150	365	**13¢**
158	20	750	163	**13¢**
149	20	1500	115	**13¢**
151	20	2250	94	**13¢**
152	20	2750	85	**13¢**
153	20	5000	63	**13¢**
154	20	12500	40	**13¢**
155	20	50000	11.8	**13¢**

25 WATT—ADJUSTABLE VITREOUS ENAMEL RESISTORS—TUBE SIZE ⅝" x 2½"

Catalog No.	Wattages	Resistance Ohms	Current Milliamperes	Price
156	25	5	2240	**25¢**
157	25	10	1580	**25¢**
158	25	25	1000	**25¢**
159	25	50	707	**25¢**
160	25	75	575	**25¢**
161	25	150	400	**25¢**
162	25	200	353	**25¢**
163	25	1500	129	**25¢**
164	25	2000	112	**25¢**
165	25	3000	91	**25¢**
166	25	4000	79	**25¢**
167	25	6000	64	**25¢**
168	25	7500	57	**25¢**
169	25	12000	42	**25¢**
170	25	15000	33	**25¢**
171	25	20000	25	**25¢**

50 WATT—ADJUSTABLE VITREOUS ENAMEL RESISTORS—TUBE SIZE ⅝" x 4½"

Catalog No.	Wattages	Resistance Ohms	Current Milliamperes	Price
172	50	5	3160	**60¢**
173	50	100	707	**60¢**
174	50	1000	224	**60¢**
175	50	1500	182	**60¢**
176	50	2000	158	**60¢**
177	50	10000	70	**60¢**
178	50	80000		**50¢**

ATTENTION: If you purchase any assortment of these resistors in total amounts to exceed $100.00, deduct 20%.

50 WATT—FIXED VITREOUS ENAMEL RESISTORS—TUBE SIZE ¾" x 4½"

Catalog No.	Wattages	Resistance Ohms	Current Milliamperes	Price
179	50	50	1000	**25¢**
180	50	750	258	**25¢**
181	50	1500	183	**25¢**
182	50	2000	158	**25¢**
183	50	10000	70	**25¢**
184	50	15000	57	**25¢**
185	50	30000	33	**25¢**
186	50	40000	25	**25¢**
187	50	50000	20	**25¢**

80 WATT—ADJUSTABLE VITREOUS ENAMEL RESISTORS—TUBE SIZE ⅝" x 6½"

Catalog No.	Wattages	Resistance Ohms	Current Milliamperes	Price
188	80	15	2310	**40¢**
189	80	25	1790	**40¢**
190	80	50	1265	**40¢**
191	80	100	894	**40¢**
192	80	250	566	**40¢**
193	80	300	517	**40¢**
194	80	500	400	**40¢**
195	80	750	327	**40¢**
196	80	1000	283	**40¢**
197	80	1500	231	**40¢**
198	80	2000	200	**40¢**
199	80	2500	179	**40¢**
200	80	3500	152	**40¢**
201	80	5000	126	**40¢**
202	80	7500	103	**40¢**
203	80	20000	63	**50¢**
204	80	25000	50	**50¢**
205	80	30000	42	**50¢**
206	80	40000	31	**50¢**
207	80	60000	21	**50¢**
208	80	75000	16.5	**50¢**
209	80	80000	15.5	**50¢**

ESSE RADIO CO. 42 W. SOUTH ST. INDIANAPOLIS, IND.

ESSE Radio Co.

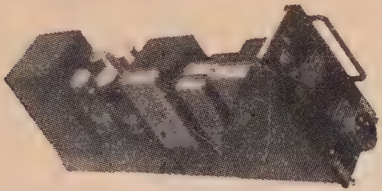
40-42 W. SOUTH STREET
INDIANAPOLIS 4, IND.

Unless Otherwise Stated, All of This Equipment Is Sold As Used
CASH REQUIRED WITH ALL ORDERS
Orders Shipped F.O.B. Collect

T-39/APQ-9 RADAR TRANSMITTER

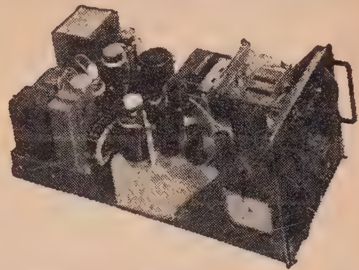
Contains many excellent parts for the VHF experimenter such as a cavity oscillator using 2-RCA 8012 tubes rated at full output to 500 Mc. Tubes are forced air cooled by 24 V. DC motor, which is easily converted for 110 V. AC operation. Other valuable parts such as a pair of 807's, 2-6AC7, 1-931 and 1-6AG7 tubes; ceramic switch, potentiometers, gears, revolution counter, etc. See Feb. CQ p. 18 for complete details for the conversion of this unit for operation in the 420-mc band....... **$9.50**

PP-51/APQ-9 RECTIFIER-POWER UNIT



400 cycle 115 V. Contains 2—4Mfd. 1000 V. DC condensers, 2—1Mfd. 1500 V. DC condensers, 400-2600 cycle transformers, power resistors, etc. Weight 38 lbs. Size 21"L x 5⅛"W x 7¾"H **$4.95**

T-26/APT-2 RADAR TRANSMITTER

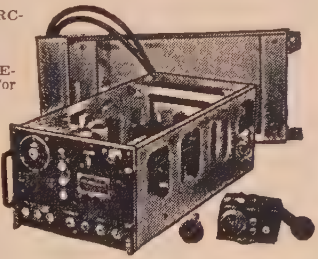


Contains tunable VHF circuit using 2—JAN CTL 703A's or 368AS tubes. Other tubes are: 2—5R4GY's, 1—2X2, 1—807, 1—6AG7, 2—6AC7's, and 1—931A. Other parts such as 24 V. DC motor and blower, HV condensers and transformers, terminal strips and Amphenol connectors, knobs, fuse holders, etc. make this unit invaluable for parts alone. Weight approx. 45 lbs. Size 21"L x 10½"W x 7¾"H, in metal case. Price **$19.75**

PP-2/APQ-5 POWER UNIT

400 cycle, 115 V. Contains 10 tubes as follows: 2—5U4G's, 1—6X5GT, 4—6Y6G's, 1—6SL7GT's, 2—VR150-30 and numerous condensers, transformers and resistors. Weight 17 lbs. Size 21"L x 5¼"W x 7¾"H................ **$4.95**

RT-19/ARC-4 WEST-ELECTRIC TRANSMITTER-RECEIVER. For 100-152 Mc. operation. Similiar to 522 except more compact. Complete with all tubes.
$24.95



XMTTR/MODULATOR BC-1158-A. Ideal for conversion to 10-meter mobile transmitter. Uses 4 type 815 RCA tubes, 10 type 12SN7 tubes, milliammeter, blower fan. 24 V. DC operated. Complete with tubes & tuning meters. **$19.50**

BC375 XMTIR TUNING UNITS

TU- 7-B	4.5/6.2 Mc	$1.50
TU- 9-B	7.7/10 Mc	$1.50
TU-10-B	10/12.5 Mc	$1.50
TU-26-B	200/500 Kc	$1.50

TELRAD 18-A FREQUENCY STANDARD. Checks signals in the range of 100 Kc. to 45 Mc. with a high degree of accuracy. Self-contained power supply is 110, 130, 150, 220, and 250 V. 25-60 cycle AC. Complete with tubes, dual crystal and instruction book. **$24.95**

INDICATOR SCOPE ID-41 APQ-13

About 6" diameter by 15" deep. Contains 1—5FP7, 1—6AK5 tube, 5 Grain of Wheat, 3 V. pilot lights, magnetic deflection yoke, condensers, resistors, potentiometers, sockets. **$4.95**

MAGNESYN INDICATOR

To be used for beam antenna. Practically same as 1-81-A Selsyn indicator. 15-25 V. 60 cycle AC. 3" size. Less plug. Excellent condition. .... **$1.25** ea.

SPECIAL

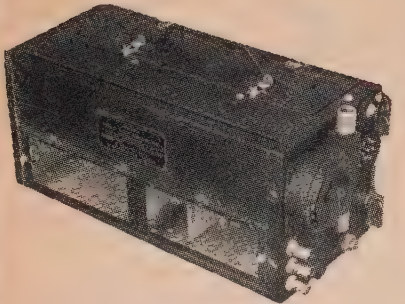
10BP4 TUBES	$16.00
12LP4 TUBES	$18.00

ESSE RADIO CO., 42 W. SOUTH ST., INDIANAPOLIS, INDIANA

ESSE Radio Co

40-42 W. SOUTH STREET
INDIANAPOLIS 4, IND.

Unless Otherwise Stated, All of This Equipment Is Sold As Used
CASH REQUIRED WITH ALL ORDERS
Orders Shipped F.O.B. Collect



RECEIVER CW-46048

A really hot receiver which makes an ideal auxiliary for the ham shack or for mobile installation. Made to operate from 12 or 24 V. DC systems; however, tubes may be wired in parallel for 6 V. filament operation. Tunes frequency range of 195 Kc. to 13,575 Kc. with the plug-in tuning coils listed below. Contains six tubes. Size 6½" x 6½" x 15".

$5.00

TUNING COILS

DUAL RANGE-kc 1.50 ea.
00/P-187-305/281-455
L/N-390-634/5915-9120
Q/G-524-844/2960-4620
Q/M-529-854/5075-7780

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H-3865-6265

BC-348 COMMUNICATIONS RECEIVER

6 bands, 200-500 Kc. and 1.5-18 Mc. 2 stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V dynamotor. These receivers have been thoroughly checked in our work-shop and found in excellent condition. Converted to 110 V. AC 60 cycle **$110.00**
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BC-312-N-1500/18,000 Kc.-14 V. DC-Excellent cond
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Price **$60.00**

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Price **$60.00**

RADIO COMPASS RECEIVER BC-433F. Made by Fairchild. Tubes: 8 6SK7, 1 6U6GT, 2 6SC7, 1 6SA7, 1 6C5, 2 6H6, y 6B8. Frequency 200 KC to 1750 KC in three ranges.
Priced **$22.50**

DYNAMOTOR PE101C

Size about 4" dia. x 14" long. Shipping weight approx. 15 lbs. Made to order for BC-645A 420 Mc. Citizens Band transmitter-receiver. Input 13 or 26 V. DC; output 400 and 800 V. DC and 9 V. AC. Brand new .. **$2.50**

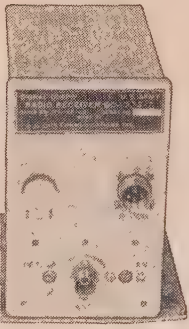
BC-733D LOCALIZER

A part of aircraft blind landing equipment. Operates on any six of its predetermined crystal controlled frequencies in the range of 108-120 mc. Contains 10 tubes, three of which are WE-717-A's—and crystals. Ideal receiver for conversion to 144 mc. ham band or mobile telephone bands. For 24 V. DC operation. Size 14½" x 7" x 4⅝"
Price with dynamotor .. **$8.95**
Price without dynamotor . **7.95**

8" RL105A-1 PM LOUDSPEAKER. Manufactured for RCA. Resonance 75-95 cycles per sec. 2.15 oz. magnet. 10 V. ampere power. 3.2 ohms voice coil impedance. Complete with output transformer to match. New **$2.75**

TYPE G1047C1CA1-KA AUTOMATIC PILOT CONTROL BOX. Used for control of C-1 Auto pilot. Contains 7 pilot lights and bulbs, 6 toggle switches, 13 potentiometers, terminal board, resistors, etc. Used **$3.75**

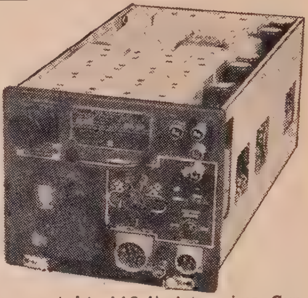
MARKER-BEACON RECEIVER



Responds to modulated signals over a variable range of 62 to 80 Mc. Tube plates and filaments operate directly from 24 V. DC. Can be adapted for radio control of experimental apparatus opening garage doors, etc. Circuit diagram and parts list included on either model shown below:
(BC-357) — contains 12C8 and 12SQ7 tubes and sensitive relay (size 5⅜" x 5¼" x 3¼"). **$1.95**
(BC-1033) — contains 6SH7, 6SL7 and 12SN7 tubes, sensitive relay (size 5⅜" x 5¼" x 3¼") **$2.50**

TURCO AMPLIFIER
with tubes **$1.50**
Less tubes **.50**

NAVY ARB RECEIVER CRV-46151



195 Kc. thru 9 Mc. Includes broadcast band. Can be converted easily to a good ham receiver. 28 V. DC input. Covers 4 bands. This is a deluxe type super-het receiver. Note: The frequency coverage includes the standard broadcast band. Has 4-gang tuning condenser; can be converted to 110 V. AC receiver. Complete with tubes: 12SF7, 12SA7, 3—12SF7 and 12A6. Dial is built on front of chassis Electric driven or manual band change switch. Weight 28 lbs. Size 6" x 7" x 15" Complete with tubes and dynamotor **$19.95**

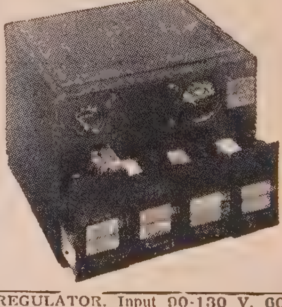
PILOTS CONTROL BOX CRV-23254. Used with CRV-46151 aircraft Receiver. ARB series. Original packing. New .. **50c**

TUNING HEAD—CRV-22253. Used with CRV-46151 Receiver ARB Series—Brand New................. **50c**
HS-23 & HS-33 HEADSETS. Used, as removed from aircraft. Excellent condition. .. .. **$150** pr.

RADIO HEADSET NAVY TYPE CDC. Mfr'd by Dictograph. Complete with rubber ear cushions and cord. High impedance dynamic type. Brand new... ....**$3.50** pr.

DYNAMIC HEADSET NAVY TYPE 49453. Mfr'd by Perm-O-Flux Corp. New. high impedance type. Complete with rubber ear cushions. ....**$3.50** ea

SPERRY A-5 AUTO PILOT AMPLIFIER RACK



Contains 115 V. AC voltmeter and 350-450 cycle Frequency meter. A otal of 4 amplifier chassis complete with following tubes included in rack: 2—1631's, 6—1632's, 3—1633's, 3—1934's and 2—1644 tubes. Numerous transformers resistors and condensers make this unit invaluable for parts. Weight 38 lbs. Size 12"L x 14"W x 10¼"H. Price **$5.95**

TRANSTAT VOLTAGE REGULATOR. Input 90-130 V. 60 cycles. Output 115 V. Maximum current 30 amps. New **$22.50**

ESSE RADIO CO., 42 W. SOUTH ST., INDIANAPOLIS, INDIANA

SCRATCHI

(from page 4)

Scratchi are just about to go look for Itchi when he driving in driveway and rushing out of car and asking me what happening. Me, he's asking—at least he can't blaming me for airplanes on the ranch. Together we go out toward airplanes just as crews of planes are coming toward us. One pilot yells out 'Hey grease monkeys, where's the main hanger?", and another are telling Itchi to hurry up and getting gas trucks to refuel his bomber.

Scratchi are looking at Itchi and Itchi are looking at Scratchi, and as this not getting us anywhere we both looking at the horde of people now crowding around, asking for weather reports, gasoline, hot coffee, and everything under the sun when Zzummm!! big batch of jets are screaming overheads are making for landing—thirty, then fifty jets screaching in and landing on far parts of ranch.

At this juncture I are beating rapid retreat, leaving Brother Itchi tearing hair and trying to find out what happen. Just on hunch are going in to new radio equipment and lifting up cover on transmitter. Sacremento!! there are the trouble, as right on the nameplate, big as 160 meter vertical antenna, are name of transmitter, and I quoting: *U. S. Air Force Portable Pinpoint Landing Field Homing Beacon.*

No needing to go into gruesome detales, Hon. Ed., except to saying that trucks have been rumbling in and out of Itchi's ranch now for five days, bringing in gas, spare parts and food. Ranch are a wreck, with ruts two feets deep and tents pitched all over it. Itchi still not finding half of his cattle.

Hon. Ed. can I suing government for selling equipment to radio dealer which he are selling me that are not safe for dumb old amateur like Scratchi to use?

Respectively yours,
Hashafisti Scratchi

LIFE IS QUITE SIMPLE

(from page 23)

"He's trying to get out. QRX a second, and I'll kick this plate switch on, and try to hook him."

"What was that blinding flash?"

"The 866's went West."

"Is that what caused the flash?"

"Either that or the plate bug."

"I take it your transmitter is inoperative now."

"Roger!"

Curtain

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OUTPUT TRANSFORMERS

Single Output, 2500 ohms to 3.2 ohm voice coil, 5 watts for 50L6, etc. Cat. No. CO-150.
Regular Price $.87 **Special Price $.39**

Single Output, 14000 ohms to 4 ohm voice coil, 4 watts. Cat. No. CO 151.
Regular Price $1.05. **Special Price $.39**

Single Output, 2000 ohms to 4 ohm voice coil, 4 watts. Cat. No. CO-152.
Regular Price $1.05. **Special Price $.39**

Push-Pull Output, 8000 ohms (P.P. 6V6) to 4 ohm voice coil, 12 watts. Cat. No. CO-153.
Regular Price $1.86. **Special Price $.69**

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Regular Price $2.46. **Special Price $.79**

Universal Output, Push-Pull Plates (4000 to 14000 ohms) to .17 to 32 ohm voice coil. Cat. No. CO-155.
Regular Price $1 77. **Special Price $1.19**

Universal Output, Single or Push-Pull Plates (2500 to 13000 ohm) to voice coil (2 to 15 ohm). Cat. No. CO-156.
Regular Price $2.13. **Special Price $1.19**

MISCELLANEOUS TRANSFORMERS

Filter Choke AC-DC,. 10 Hy. at 70 Ma., 300 ohm DC Resistance. Cat. No. CO-157.
Regular Price $1 08. **Special Price $.39**

Line Transformer, 500-1000-1500-2000 ohms to 8 ohms. Cat. No. CO-158.
Regular Price $2.07. **Special Price $1.19**

Audio Input Transformer, Single Plate (10000 ohms) to Push-Pull Grids (90000 ohms) 3:1 Ratio. Cat. No. CO-159.
Regular Price $1.92. **Special Price $1.39**

Audio Interstage Transformer, Single Plate (10000 ohms) to Push-Pull Grids (9000 ohms). Cat. No. CO-160.
Regular Price $1.59. **Special Price $.89**

Plate Supply Transformer; completely shielded—Primary—115 volts AC. Dual Secondary 3000-0-3000 and 2420-0-2420 volts AC. **Out of Filter** 2500 volts DC and 2000 volts DC. Rated DC Ma. 300. Cat. No. Thordarson T-19P65.
Regular Price $22.32. **Special Price $14.88**

Plate Supply Transformer; completely shielded—Primary—115 volts AC and 230 volts AC. Dual Secondary 750-0-750 and 600-0-600 volts AC. Rated DC Ma. 300. Cat. No. Thordarson T-15P13.
Regular Price $17.28 **Special Price $11.52**

Receiver Power Supply; completely enclosed in black crackle, Slant front cabinet. Primary—115 volts AC. Secondary No. 1—155 volts DC at 5 Ma. Secondary No. 2—6.3 volts AC at 2.5 Amps. Cat. No. National 5886.
Regular Price $22.43 **Special Price $8.97**

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RADIO & ELECTRONICS PARTS CORP.

3235 Prospect Ave. Dept. A Cleveland 3, Ohio

PUSH BUTTON CONTROL CIRCUIT

(*from page 19*)

is the keying relay (d.p.s.t.) and K_4 supplies the delay. S_1 connects the key and delay circuit when in the c.w. position, and shorts the delay contact in the phone position. For c.w. the keying relay contact supplies power intermittently to a delay circuit consisting of K_4 and C, which, in our case, is a 1000-µf 25-volt electrolytic condenser across a 150-ohm telephone-type 12-volt surplus relay. This unit turns off the receiver, switches antennas, and turns on the transmitter plate voltage with the first "dit" and remains on for a very short period after the last character has been sent.

If it is desired to parallel several "Start-Stop" buttons in different positions around the shack, or if "break-type" buttons are not easily obtainable, two-"make" pushbuttons can be used across K_2 in a 3-wire circuit as shown in *Fig. 3. R* is a protective resistor which avoids short-circuiting the power supply during the release pulse.

BUILDING AN OPERATING CONSOLE

(*from page 22*)

place and some aluminum edging fastened around the front and side edges. Casters may be fastened as as shown in the drawing.

Finishing Touches

When the construction of the desk console sections have been completed, including the filling of holes and sandpapering, an undercoat may be applied in preparation for the finishing coat. I used French Gray enamel for the finishing coat to match the color scheme of the transmitter. While the undercoat is drying, work on the panels can be started. I cut my panels from 1/16″ hard sheet aluminum. Five panels are cut to cover the entire front of the console proper. The size of the holes in the panels are dependent on the units which are mounted in back of these panels. Cut the hole large enough so that all controls of the unit being mounted are accessible through this hole or window. Panels are fastened to the framework of the console by means of small wood screws.

We are now ready to mount the various pieces of station equipment within the console proper. *Fig. 3* shows how this may be done. Two small wooden stands are constructed of some 1″ pine or plywood to hold each unit at an angle so that the front panel of the unit being mounted is parallel to the console panel. Cover the top of these stands with felt or sponge rubber stripping. This helps to shockmount the equipment. Be sure to leave enough room between the two panels for the small lamps which light the panels of the various units. I fastened ordinary pilot lamp sockets to the panels themselves and used a 6.3-volt filament transformer as a source of voltage.

It is a good idea to run a heavy copper strip along the entire length of the back of the console. This strip can be used as the common ground terminal. 117-volt receptacles may be fastened along the lower inside back of the console at convenient places to supply power for the various pieces of equipment. If you have trouble with r.f. feedback in any of the equipment within the console as I did, build up an r.f. line filter which will carry the load of the entire contents of the console.

To facilitate servicing of the various units it is wise to fit the units with plugs so that the units may be removed individually.

If excessive heating of the equipment is evident, mount a small fan within the console to provide some forced ventilation.

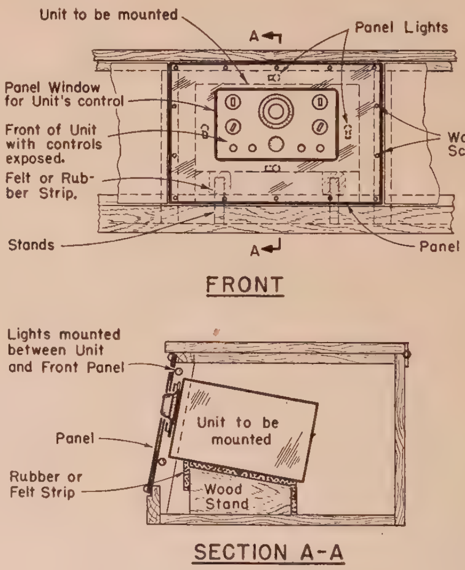

Fig. 3. Illustrating one way of mounting individual units within the console proper.

When work within the console is completed the three lids of the console may be fastened in place by means of hinges as shown in the drawings and photos.

Upon completion of the job you will no doubt experience a real feeling of satisfaction and when the local boys drop in and the Ohs! and Ahs! die away, perhaps you can pass along to them some pointers on how to construct a similar operating console for their station.

P.S. Don't be surprised if you find yourself operating the station more frequently than you did before you constructed your console. This is a natural reaction.

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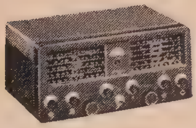
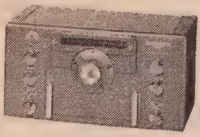
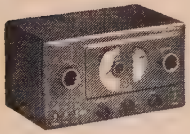

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FOUR-BAND MOBILE TRANSMITTER

(from page 37)

which brought the end of the threaded shaft, on which the slug is mounted, well up into the polystyrene mount and prevented its touching the chassis.

As a proposed means of simplification, an Ohmite Z 14 choke was tried in this position for all bands and gave adequate results, although the slug-tuned forms are to be preferred.

All coil sockets except that for the 815 final stage are mounted on the chassis. For the final a small aluminum bracket was built up out of 1/16 × 1 1/2-inch stock. A 90° bend was made 5⅛ inches from one end (this end to be later fitted flush with the bottom edge of the chassis). The bent-over section was made 1¾ inches long, and in the center of it was mounted the ceramic socket for the final coils. Thus positioned, the coil was near the plate connections of the 815 and in line with the variable link arrangement, to be explained later. This bracket should be mounted so as to clear just nicely the glass envelope of the 815. In our case the center line of the bracket was 3¼ inches back from the front panel.

In *Fig. 3* metering positions 3 and 4 are the usual resistors but are shunted at the meter switch to double the scale value of the meter. These shunts are indicated in *Fig. 4*.

Link coupling is used for the output, and the link is variable. Seven turns of #18 tinned wire were wound on a piece of polystyrene rod 1 inch long and ⅞ inch in diameter. The ends of the winding were brought out at the rear through holes drilled in the rod and attached to short lengths of Litz wire for flexible connections to the co-axial output fitting. A 13/64 inch hole was then drilled along the center of the 1 inch length and tapped for ¼–20. Next a 4-inch length of ¼ inch bakelite rod was threaded ¼–20 on one end and screwed into the polystyrene section. After passing the rod through a panel bushing, a knob was fastened to the outer end. The ease with which this coupling rod may be slid in and out is controlled by the nut on the tapered section of the split skirt on the panel bushing.

Only two grounding points are used on the transmitter, one at the grid of the 6SC7 for all audio grounds, and one at the grid of the 6AG7 oscillator tube for all r.f. grounds.

In the bottom view, as seen in *Fig. 2*, the oscillator tuning condenser may be seen in the center of the chassis. Above and to the left is the insulating bracket holding the doubler tuning condenser. In the upper left-hand corner of the chassis is the keying relay and below it the filament relay. The choke near the top edge of the chassis and just to the right of the doubler tuning condenser is the choke of the keying filter. In the lower right-hand corner are grouped the metering switch, the audio gain control potentiometer, and the microphone batteries.

In the front view of the transmitter panel the controls are, beginning at the top right-hand corner: knob for varying coupling, to the left the coaxial fitting for the link output, and beside it (nearest the center of the panel) a coaxial fitting for the receiver antenna. Below the coupling knob is the control for the final tuning condenser and, below it, the plug for the PE-103 power supply cable. To the left of this power plug is the doubler plate tuning condenser control, and next, in the center, the dial for the VFO control. Above and to the right of this VFO dial is the excitation control. The numbered dial to the left of the VFO dial is the metering switch. To the left and below this metering switch dial is the receptacle for the 6-pin Jones plug on the cable leading to the remote control box. Above this receptacle are two jacks, the left-hand one for the microphone, and the right-hand one for the key. Midway up the panel are the two toggle switches whose functions were discussed in detail earlier. Below the right-hand jack and near the edge of the metering switch dial may be seen a faint vertical line about ¼ inch long. This is the slotted end of the gain control pot. At the extreme lower right-hand corner of the panel is a binding post for a chassis ground connection.

DX & OVERSEAS NEWS

(from page 43)

my two fingers have been lucky and have found the right keys. Let's hope Betty is going to keep up the good job as her work on the column has been appreciated by all of us. There's not many gals who can take down the screwy ham lingo together with all the call letters you find in each month's column. As you may know I'm a manufacturer's Rep. for radio parts and equipment and she has to wrestle with part of the business, too. Anyway . . . this column . . . Andy also pitched in and finished it up while I was away. It's a darn good thing I have help like this. Now that the above has been recorded, if the column for the next couple of months seems confused it could be because of the above. We'll do our best. 73.—*Herb*

QTH COLUMN

EA4DA	Box 220, Madrid, Spain	
FK8AI	C/o Airport, Tontouta, New Caledonia	
HP1TP/HP2	Box 2195, Cristobal, Canal Zone	
HR1PA	C/o American Embassy, Tegucigalpa, Honduras	
LU—	via R.C.A., Av. Alvear 2750, Buenos Aires, Argentina	
LU1ZA	Observatorio Metereologico	South Orkney Is.
LU4ZA	Eduardo B. Silva	
LU5ZA	Enrique Jose Smith Estrada	
LU6ZA	Lauro Virgil	
LU7ZA	Alejandro Dubini	
LU8ZA	Reynaldo Soto	
LU1ZB	Destacamento Naval	Melchior Is., Palmer Peninsula, Antarctica
LU2ZB	Arturo A. Cichero	
LU3ZB	Domingo Gonzales	
LU1ZC	Destacamento Naval	Deception Is., South Shetland Is.
LU2ZC	Carlos N. Enemark	
LU3ZC	Alvaro E. Castellanos	
PJ1UF	P.O. Box 80, St. Nicholas, Aruba, N.W.I.	
PK6LN	Box 76, Macassar, Celebes	
VQ2VR	40 Geddes St., Nkana, No. Rhodesia	
VQ4AO	Box 799, Mombasa, Kenya	

THE ANTENNASCOPE

(*from page 18*)

overall natural period of the antenna, and the impedance characteristic will be broadened.

A corrected twin lead folded dipole may be easily and accurately set up through the employment of the Antennascope. First cut a length of twin lead to an electrical length of a half wave of the desired frequency, using the instrument as described earlier. Then place permanent shorts across each end of the line, and at the exact center open one side of the line for the feedpoint. Now add equal lengths of wire at each end of the twin lead so that the total length of the antenna will be slightly longer than calculated by formula. See *Fig. 3F*. Then, using the Antennascope, connected directly or remotely at the center, trim the end wires equally until resonance is indicated at the desired frequency. If remote measurements are to be made and if the half wave line to be used is made of the same type twin lead, its length will naturally be the same as that of the section installed in the antenna. The properties of this antenna will be approximately the same as those of the ordinary folded dipole.

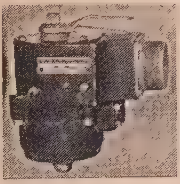
Harmonic Antennas

Antennas made up of any multiple lengths of a half wave may be measured at the desired operating frequency by connecting the Antennascope, either directly or remotely, at any high-current point. As an example, *Fig. 3G* indicates the correct points when using a three-half-wave antenna. Resistance readings will be only for that at the particular point of measurement. Resonance for this antenna when measured at X_1 will be that of the third harmonic, while readings taken at the center point X will be those of the fundamental or any odd harmonic. Readings of other harmonics may be made at points determined by the theoretical location of the current loops.

Quarter-Wave Vertical and Ground-Plane Antennas

Connect the Antennascope, or half-wave line, at the normal feed point between the base of the antenna and ground, or radials as the situation may require. See *Fig. 3H*. The resistance reading will be approximately 35 ohms.

Since the resistance at the feedpoint of a ground plane antenna may be raised by dropping the radials to form a larger than 90-degree angle with the vertical element, the Antennascope is a handy device for determining the correct angle for the



3/4 RPM ANTENNA ROTATOR MOTOR—High torque, reversible motor—operates directly from 110 Volt 60 cycle by use of condenser. Light weight, quiet running, ruggedly built, positive stop, easily mounted. Normally operates from 110 V. 400 cycle. With instructions, complete—NEW . . **$4.95** 10 MFD 400 Volt Cond. $1.00 SPST Momentary Switch 35¢ DPDT Momentary Switch 75¢ Resistor, 100 ohm 25 Watt 50¢ 4 Wire Cable .05¢ per Ft. COMPLETE KIT OF PARTS: Motor, Cond., SPST Switch, and Resistor **$5.95**

New Transformers and Chokes:

TRANSFORMERS (Cased) 115 VOLT 60 CYCLE PRIMARIES:

OUTPUT: 750-0-750 V.A.C. (600 V.D.C. after choke input filter at 250 MA) Includes 6.3 V.A.C. winding at 5 amps and 5 0 V.A.C. winding at 4 amps. CH-106 . . . . **$8.75**

OUTPUT: 600-0-600 V A C. at 250 MA. 12 V.A.C. at 3 amps: 12 V.A.C. at 3 amps: and 5 V.A.C. at amps. Designed for Army surplus transmitters. CH-108 . . . . **$7.75**

OUTPUT: 250-0-250 V A C. at 60 MA. 24 V.A.C. at .6 amps: 6.3 V.A.C. at 6 amps. Designed for Army surplus Receivers CH-109 . . . . **$3.50**

TRANSFORMERS—110 VOLT 60 CYCLE PRIMARIES:

Sec. 12 V. 1 amp. . .	**$1.50**	Sec. 24 V. .5 amp. . .	**$1.50**
Sec. 24 V. 1 amp. . .	**1.95**	Sec. 36 V. 2.5 amp. . .	**2.95**
Sec. 24 V. 4½ amp.	**3.95**	Sec. 14-14 or 28 V. 7½ or 15 amp. . .	**5.50**
Sec. 24 V. 2 amp. . .	**2.25**		

CHOKES (Cased)

CH-115—8 Henries at 500 MA. filter choke, 5,000 volt insulation **$10.95**

CH-116—5-20 Henries at 500 MA. swinging choke, 5,000 volts insulation **$10.95**

CH-121—13 Henries at 250 MA. filter choke, 1,500 volt insulation **$4.95**

WHIP ANTENNA MAST BASES—INSULATED:

MP-132—(Illustrated) 1" heavy coil spring, 2" insulator. Overall length: 11½". Wt.: 2¾ lbs. Price **$3.95**

MP-22—Spring action direction of bracket. 4" x 6" mounting. Price **$2.95**

MAST SECTIONS FOR ABOVE BASES:

Tubular steel, copper coated, painted 3 foot sections, screw-in type. MS-53 can be used to make any length with MS-52-51-50-49 for taper. Price—any section **50¢ Ea.**

MS-54 or 55. Larger sections than MS-53 **75¢ Ea.**

BAG BG-56 for carrying 5 mast sections . . **50¢ Ea.**

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	USED:	NEW:
BC-453 Receiver, 190-550 KC.	**$11.95**	
BC-454 Receiver, 3—6 MC.	**5.95**	**$7.95**
BC-455 Receiver, 6—9.1 MC.	**6.95**	
BC-457 Transmitter, 4—5.3 MC.	**$ 5.95**	**$8.95**
BC-458 Transmitter, 5.3—7 MC.	**5.95**	**8.95**
RACKS—Dual Transmitter or Receiver		**$1.50**
PLUG for pluging in rear of Rec. or Trans.		**55¢**

BRAND NEW BLOWERS

115 Volt 60 cycle Blower as pictured at left. Approx. 100 Cubic Ft. Displacement, 3¼" intake 2" outlet. Motor size: 3½" x 3". 1525 RPM. Complete with mounting bracket. Brand new, Gov't. surplus. Order No. CQ-3604 **$7.95**

DYNAMOTORS:

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desired resistance in any specific case. See *Fig. 3I.* The limit obtainable is about 70 ohms, at which point the radials will be folded all the way down so that they too are vertical, and the system then resolves into the form of a coaxial antenna. Resonance of the vertical antennas may be adjusted by varying the length of the vertical portion, and that of the radials if involved.

Mobile Antennas

Quarter-wave mobile antennas may be measured for resonance and resistance in the same manner as employed with the vertical antennas. See *Fig. 3J.* The average antenna of this type will have about 45 ohms resistance, providing a sufficiently close match for a 50-ohm line.

Base or center loaded antennas may be likewise checked. Resistance readings will be in the 20 to 35 ohms region. Referring to *Fig. 3K,* by correctly proportioning the antenna length and the ratios of *L* and *C,* the system may be adjusted so that the feedpoint will have a resistance value to match either a 50 or 70 ohm line. The correct adjustment may be determined according to readings found with the Antennascope.

Parasitic Beams

Connect Antennascope, or half-wave line, at the center of the driven element, as with any half-wave antenna. Resistance readings will usually lie between 10 and 100 ohms, being dependent upon the exact spacing and tuning of the other elements. Resonance will also be dependent, to some extent, upon these factors, which will make it difficult exactly to calculate the length of the half wave if needed for remote measurements. For this situation the antenna system may be tuned up to a prescribed frequency, with the line cut accordingly, as previously suggested; however, in most cases, the center of the driven element will be accessible so that the instrument may be used directly.

Occasionally one or two slightly different frequencies may be indicated by the Antennascope. This is due to reflections from other elements, and must be analyzed in each individual case. With the beam correctly tuned, only one frequency will be indicated by a complete null at the true resonant frequency. As already stated, partial nulls indicate reactive impedance, which will be the incorrect point to consider.

The author has found it generally good practice to resonate the driven element while the reflector is set at a length about 5% longer than this element and the directors set about 5% shorter. The beam adjustment may then be left set, since only little improvement will usually be gained over this arrangement by retuning the parasitic elements through the customary lengthy process of checking against field strength readings, but, if finite adjustment of the other elements is desired, it is suggested that the Antennascope be employed as a means of initially tuning the driven element. The parasitic elements may then be tuned in the usual manner, with occasional checks being made for antenna resonance. This latter step may be made with the Antennascope used as a s.w.r. meter as will be subsequently explained.

Adjusting *Q* Bars

Q Bars, as quarter-wave transformers, often used as a matching device between an antenna and a transmission line, may be adjusted by connecting the Antennascope at the line end of the bars, with the other end being connected to the antenna. The spacing between the bars should then be adjusted to obtain the necessary impedance. They must first be cut to the correct length, and the antenna must be resonant at the frequency to be used.

Standing Wave Ratio

If the meter indicates a complete null when the Antennascope is inserted in the transmission line, the indicated s.w.r. will be unity, or 1 : 1.

Ratios higher than 1 : 1 may be determined if the line is a multiple of a half wave long at the frequency involved, and if the antenna is resonant. Just rotate the Antennascope dial, while slightly adjusting the generator frequency if required, until the null is found, indicating the resistance of the termination. The s.w.r. may then be determined by

$$\text{s.w.r.} = \frac{Z\ \text{load}}{Z\ \text{line}}.$$

The instrument itself may be calibrated for various ratios[1], but the readings will be inaccurate unless the above conditions prevail. Lines of other lengths will reflect an impedance different than that found at the termination, and this impedance will be reactive, particularly if the antenna is not resonant. This same difficulty, of obtaining an accurate reading of s.w.r. other than 1 : 1, may be found with many current types of s.w.r. meters.

As with other measurements, the ideal procedure is to tune up an antenna to a prescribed frequency while matching the line. This may be readily done with the Antennascope connected at the sending end of the line. In order to avoid confusing nulls, due to line resonances, it is suggested that the length of the line be held shorter than one wavelength. Set the instrument dial at the line impedance, and vary the generator frequency, near that calculated for the antenna, until a null is observed. If this occurs at a point other than at the desired frequency, adjust the antenna until resonance is obtained at the correct frequency, as indicated by the Antennascope null.

If the null is incomplete, and if a variable matching device is being used, it should be adjusted until a complete null is realized at the resonant frequency. When a matching system, such at the T match, is employed, the antenna will often have to be resonated with each subsequent change in the setting of the T, as the antenna resonance will be affected by these changes.

If no variable matching arrangement is used, and if the line is otherwise correctly terminated at the resonant antenna, the meter will indicate a complete null, and the s.w.r. will be unity. Stress is again placed on the fact that a unity ratio can not be obtained unless the line is not only termi-

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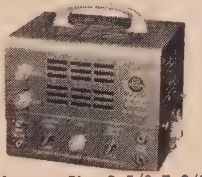

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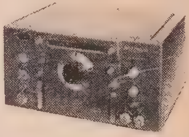

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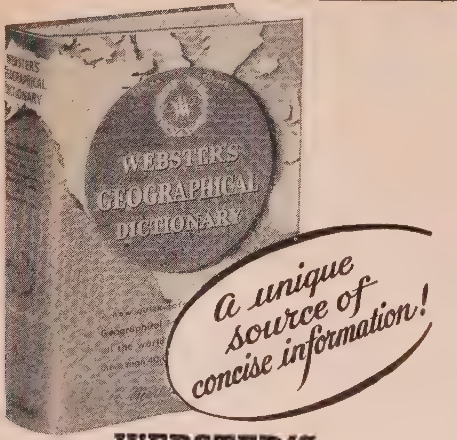
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nated by an impedance equal to its own surge impedance, but also that this impedance must be resistive, which in turn is not possible unless the antenna is resonant at the frequency involved.

When the complete null is realized, indicating a 1 : 1 ratio, the length of the transmission line should be altered by ⅛ or ¼ wavelength to verify the reading. If the s.w.r. has been correctly adjusted to unity, no change should be noted in the meter null.

Receiver Input Impedance

Connect the Antennascope to receiver input terminals, and tune receiver to the frequency at which the impedance is to be determined. Set the generator at the same frequency, and rotate the impedance dial until the complete null is found. Re-trim generator frequency if necessary. As with antennas, the input circuit must resonate at the frequency employed, in order to read the resistive component. If the input circuit is tightly coupled, as it is on many sets, two impedance readings at slightly different frequencies will be noted. One reading will be low, between 10 and 20 ohms, and the other reading will be anywhere from 50 to 500 ohms. The reason for this is that the reactance of the coupling loop between the generator and the input side of the Antennascope reflects upon the tuned input circuit of the receiver the very low impedance readings being evidenced at this point. Although the loop reactance may be tuned out, moderate accuracy may be had by relying upon the higher reading.

In place of measuring existing units, the Antennascope may be used to better advantage by adjusting the input coupling system of the receiver to match a line of a certain impedance. The most common type of input circuit is shown at *Fig. 3L.* This consists of a coupling link of one or more turns placed at the cold end of the tuned input circuit. The impedance may be adjusted by varying the number of turns in the link, and/or varying the degree of coupling by moving the position of the link. Too tight coupling will indicate double readings as noted above, while too loose coupling will produce incomplete nulls, because the impedance then is reactive instead of resistive.

Another coupling method, shown at *Fig. 3M*, is that of tapping the input lead at the proper point on the input inductor. This method provides rather tight coupling, and the double readings will usually be found.

Fig. 3N shows the capacitance divider, or R9'r, type of input matching system. C_1 (5–10 μμf) controls the degree of coupling which is increased as the capacitance is raised. The impedance ratio between C_1 and C_2 (50–200 μμf) determines the ultimate impedance across the input terminals X. The larger the capacitance at C_2, compared with that of C_1, the lower the input impedance. After each adjustment, the setting of C_3 must be changed to restore resonance. The degree of coupling will produce the same effects mentioned above.

The circuits shown at *Figs. 3L* and *3M* are rather difficult to set for low impedances at high frequencies, while that of *Fig. 3N* may be quite easily tuned for low impedances.

When an input circuit is to be adjusted to match a line of a certain impedance, it is best to employ a length of the line between the Antennascope and the receiver while the adjustments are being made. Following these adjustments, the length of the line should be then altered, in which case the impedance reading should remain the same if the input circuit has been correctly set.

Miscellaneous

Coupling measurements are not limited to receiver inputs. Similar procedures may be utilized for matching to antenna couplers or similar devices. Other measurements such as the reflective impedance of low pass filters, etc., may be made.

Antennas other than those considered above, and many other circuits encountered in and around the ham shack, may be checked by following the basic principles described. Many problems which we threw up our hands at a few months ago are mere routine "ohmeter" tests these days.

References

[1] Scherer, "Balanced Feed systems with Coax," *CQ*, July '49.

[2] Scherer, "Applications of the Grid Dip Oscillator," *CQ*, Jan. '49.

[3] May be found in most any handbook.

[4] Roberts, "Input Impedance of a Folded Dipole," *RCA Review*, June, 1947.

V.H.F.—U.H.F.

(from page 39)

when conditions are poor and no DX signals are available. The only procedure for a station desiring a contact under these circumstances is to call CQ on some frequency—it doesn't matter much which one, and then tune the band for an answer. If some specific frequency were selected as a calling frequency, a station looking for a QSO could call CQ on this channel. Or, he could leave his receiver tuned to the calling frequency and wait until another station was heard from. Much of the "band-scanning" formerly necessary could be eliminated. The possibilities of making a contact on an otherwise dead band would be increased. The length of calls could be greatly reduced. In short, the idea has some merit. Now that 50.1 has been selected as the official "calling frequency," why not go along with the idea? When you are looking for a contact, park the rig on 50.1 while you're calling CQ. You probably won't even have to re-tune the exciter or final. Hook 'em there, and after contact is established, slip back to your usual groove to complete the QSO, leaving the calling frequency clear. And while you are puttering around the shack but don't feel like operating, leave the receiver set on 50.1—see how soon someone pops up. You'll spot a lot of band-openings that way, if this idea catches on. Better use a crystal calibrator to locate the spot, and leave

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The 1200-Mile Two-Meter Record

Last month we reported the story of the record-breaking 144-mc contact between W5VY of San Antonio, Texas, and W8WXV, of Shiloh, Ohio, DX 1196 miles. There has been considerable discussion since this record was hung up on whether sporadic-E reflections or good tropospheric conditions made the record possible. In *VHF News* for July, 1950, W0MNQ offers a detailed analysis of the weather conditions that existed over the path from Texas to Ohio during the 24th of June, and he finds some justification for assuming that the signals may have been propagated over the record distance by the troposphere alone, without an assist from sporadic E.

Reports of two-meter DX on the 24th from W4HHK, W5ML, W5QIO and others indicate that the band was indeed wide open during the early daylight hours of the 24th. There isn't much doubt expressed that this was anything but normal extended-ground-wave type DX. Since the opening seemed to move to the North later in the day, there is every reason to believe that the good conditions existed over at least part of the path at the time that the W5VY–W8WXV contact was made.

Nor is there any doubt that six meters was open. W5ML reports that many of the signals from W9-land were S9-plus, and Art is not one to exaggerate reports. Pat, W5VY, told us that six-meter signals were strong—about as strong as he had ever heard them. The fact that W5VY was hearing six-meter signals from points much closer than Ohio indicates that the signals were bouncing off the E layer at a pretty sharp angle, which is another way of saying that the grazing-angle MUF must have been higher than 50 mc. It is almost safe to assume that sporadic-E ionization was quite dense—perhaps sufficiently so to support 144-mc transmissions.

There seems to have been a "skip" condition present during the opening. W8EP, W4HHK, W0ZJB, and others along the route were known to be active at the time, but there is no evidence from their reports that conditions were exceptional on two meters over the entire path. During the QSO, W8WXV was copied by W5JLY, also of San Antonio. W5BDT, about 70 miles further north, thought that he heard a W8, but the signal did not hold up long enough for positive identification. This data may not establish definitely that skip was present, but it looks that way to us. And, it must be admitted that skip can be caused by the troposphere, although the condition is rare at 144 mc. The signals could be trapped between two elevated layers in the troposphere and guided over great distances before they broke through the lower layer and returned to earth. However, the attenuation in such a system would be pretty high over the 1200-mile route, and W8WXV wasn't running high power. . . .

In summary, it appears that conditions were good for both extended groundwave and sporadic E. This combination has popped up before in cases of exceptional two-meter DX. In *Radio,* for March, 1941, E. H. Conklin discusses the possibility that favor-

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able tropospheric conditions may well extend the range of sporadic-E transmissions. Ted Gibson, W2NCV, an engineer of the Philco Corporation and an ardent amateur meterologist, has amassed considerable evidence that ten-meter DX transmissions (which could hardly be other than ionospheric) are to a considerable extent affected by weather conditions at the terminals of the circuit. It seems to us that there must have been an intense, highly localized case of sporadic E, which brought the signals from W8WXV down to earth somewhere within ground-wave range of W5VY. Since his ground-wave range was probably extended to hundreds of miles by the good weather conditions, the possibility of the ionosphere-reflected signals coming in was greatly enhanced. Our opinion is that in this case both types of good conditions acted together to make possible the record-breaking contact. And since the peak of the sporadic-E season and the troposphere DX season happen to coincide, there is every chance that the same thing may happen again, and give someone else a shot at the record.

Aurora Openings on Two Meters

W8WXV thinks that the two-meter gang is passing up a big opportunity by not watching more closely for signs of aurora openings. He claims that two opens as early as the other bands during aurora sessions. As evidence he reports 144-mc contacts via aurora on May 27, June 23 and 29, July 3 and 11—and he indicates that this list is not complete! Al finds aurora openings happening more often than any other kind, lately. He says that a TV receiver is one of the best aurora detectors. Also, he notes the roar on foreign broadcast stations from 15 to 22 mc. Remember, for aurora, the beam should be aimed north. Voice or tone modulation are practically useless, straight c.w. is mandatory. Although aurora effects will be noted most by the stations in the northern latitudes, good ground-wave conditions will often permit signals to reach pretty far into the aurora-affected regions. W4AO noted that this condition existed on the opening of July 11—he worked W8RWW, in Detroit, and detected a clear signal when he pointed the beam via the direct route, but there was a stronger, aurora-modulated signal, when the beam was aimed north. W3BYF noticed similar effects, but Pres found that the best signals came in over the direct route. He also noticed that the polarization of the original signal was preserved. W8WXV claims that if the two-meter stations would get on the ball and take advantage of aurora he could add about 6 more states to his already FB score of 15 states, 8 call areas, plus VE3!

Miscellaneous Two-Meter Notes

PA0GT is looking for tubes and parts to complete his SCR-522 modifications. He especially needs 6AK5 tubes and 500-μμf button-type capacitors. He also could use a crystal, preferably on about 8060 for the rig. Any of you fellows who are familiar with the systems for sending such goods into the Netherlands would sure be doing him a good turn if you could help out. PA0GT is a stamp collector, and would be glad to repay the favor in PA0 stamps. The call book QTH is OK.

W7MHK apologizes for the fact that there hasn't been much activity in the Portland, Oregon, area on two meters. W7JKV's DX of 150 miles is the best accomplished to date. W7MHK is starting up a network, to meet between 7 and 10 p.m. PDT. He wants to arrange skeds in all directions. Look for W7MHK on 144.9 mc, horizontally polarized (to see whether he can do any better that way than on vertical)! Mark figures that a little activity could put the Northwest on the two-meter map.

W6AJF, Frank Jones, heard W6NQV of San Diego, 460 miles away, on July 4. Although there was no QSO established, this is about the first time that two-meter signals have been heard through the range of mountains that separtes northern and southern California.

W6MVK announces a contest, or, rather, a group of three contests, especially for Californian two-meter stations. Contest #1 is a VHF Mileage Marathon, to be won by the contestant who amasses the greatest total mileage covered on two meters during the contest period. #2 is an activity contest, with a prize for the station in each ARRL section who contacts the greatest number of stations during the contest period. Contest #3 is for expedition stations, a trophy to the one which makes the longest single contact with a fixed station during the contest period. Handsome trophies are to be awarded the winners. Tom hopes to make it a perpetual contest, to run in consecutive four-month periods. The first period starts September 1, 1950. Contact W6MVK for complete details.

W3LMC wishes that some of the teletype workers would do a little operating when the band is in good shape—he wants to work some DX on TT!

435-Mc Eavesdroppings

W7QLZ sez that his 435-mc mobile activities are impaired somewhat by a put-put which gets cranky at the higher altitudes. Clyde has to start it on a mixture of ether and alcohol. Wow! Don't get too close to the fumes, pal!

G5BY has a new type v.h.f. tube, the Mullard QQV 06–40 tetrode, which he says is about equivalent to the Amprex 9903. He uses it as a straight amplifier on 435 mc and gets approximately twice as much power output as he got from his 8012s operating as triplers with the same input. Hilton has now mounted the new amplifier at the masthead, eliminating the losses in about 35 feet of open-wire line. This change again doubled the radiated power! Local reports indicate that the signal from the new set-up is just as potent as the signal from the 150-watt two-meter rig. G5BY is waiting for

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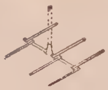

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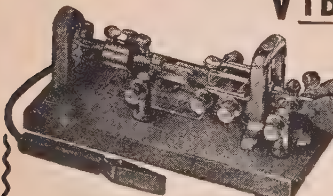

the next band opening to try it out on stations over the horizon.

W4LDW tells us that he has been fooling around with a 420-mc superregenerative ever since the bands were released, but has heard nothing except a few commercial signals and strong harmonics. He recently completed his superhet converter, which uses a 2C40 r.f. stage working into a 1N21A crystal mixer, and has already logged over 20 u.h.f. signals, using only a dipole antenna! Bill casts one vote for horizontal polarization.

We hear that the Riverton, N. J. gang have finally decided to give horizontal a try on 435. These boys may well represent a majority (at this stage of the game) in the Philadelphia area. If it's going to be decided, one way or the other, let's get it over with, and not wind up in the same mess we are now in on two meters! Off-hand, I'd predict that a little well-placed propaganda for horizontal at this time might swing the deal. We sure wish that the TV broadcasters were planning to use vertical polarization—then I'd have been a lot more strongly in favor of horizontal for 420. Don't forget, those u.h.f. TV bands will be our next big TVI problem.

That's it, for now, fellows. No more room. Keep us posted. We'll be seeing a lot of you in person at the South Jersey Radio Association Outing, at Haddonfield, on September 10. Until then, 73. . . .

Brownie, W2PAU

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PI NETWORK TANK CIRCUITS

(*from page 32*)

ner; that is to say that a higher value of C_2 will result in more plate load. In spite of this load limitation, the pi still does provide a wide range of possible load variations. It should be borne in mind that, with a fixed inductance for a given band, a wide variation in operating Q is found for load variations as shown in the second example. A fairly wide variation in operating Q is also encountered in going from one end of a ham band to another. Sub-harmonic attenuation is not as good as for the higher harmonics, so it is necessary to derive the required attenuation from the driver stages and under no circumstances should a doubler be used to feed a pi-network plate tank. The attenuation curves indicate that the higher the load impedance, the higher the attenuation, although it should be indicated that the efficiency of the tank circuit decreases as the load resistance becomes greater. This is due to the increased resistance in the coil. It is quite convenient to design pi networks to work into a 50-ohm line because RG-8/U is available on the surplus market and offers the amateur the advantage of using a well-shielded line to reduce harmonic radiation. It is quite simple to construct good low-pass filters with a characteristic impedance of 50 ohms, which, when used in conjunction with a pi network and coaxial line, offer about the best known installation to minimize TVI from harmonic radiation.

The photograph on page 32 shows a typical Class C amplifier design using a pi network. In this instance the pi matches from the tube load resistance to about 300 ohms and an L section matches to 50 ohms for additional harmonic attenuation. The unit shown is a part of a new one-kilowatt rig, the KW-1, currently being constructed by Collins Radio Company for amateur service.

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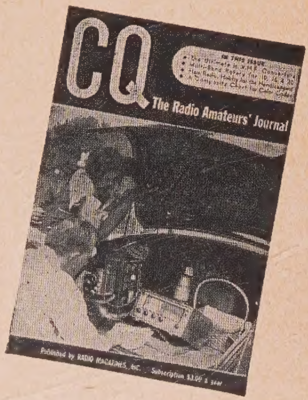

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1B4P	1.05	3CP1/S1	1.95	20-4 BALLAST	.45	102F	3.55	701A	3.00	878	1.75
1B21A/GL471A	2.55	3D6/1299	.30	REL-21	2.10	FG105	9.75	702A	2.60	879/2X2	.45
1B22	3.40	3D21A	.95	21-2 BALLAST	.45	VU111S	.45	703A/368AS	3. 60	902	3.75
1B23	7.50	3DP1	3.75	23D4 BALLAST	45	114B	.80	704A	1.05	931A	3.95
1B27	7.75	3FP7	1.85	RK24	1.55	121A	2.55	705A/8021	1.00	954	.30
1B32/532A	1.85	3FP7A	2.25	24A	.40	122A	2.65	706AY	17.50	955	.45
1B42	6.75	3GP1	4.95	VT25A/10	.45	VT127 BRITISH	.35	707A	12.95	957	.35
1B48	9.90	3H-1-7 BALLAST	.45	25Z5	.65	VT127A	2.95	707B	14.45	958A	.35
EL-1C	4.85	3HP7	3.45	25Z6GT	.52	VR150	.48	708A	3.45	967/FG17	3.75
1C5GT	.65	3Q5	.65	26	.55	VT158	14.95	709A	4.75	991/NE16	.24
1C6	.75	3Q5GT	.65	27	.55	FG172	19.25	710A/8011	1.25	1005	.30
1C7G	.85	3S4	.60	28D7	.40	205B	1.35	713A	1.45	1007	4.50
1D8GT	.90	GA4	2.00	30/VT67	.58	211/VT4C	.40	714AY	3.55	CK1089	3.90
1E7GT	.95	REL-5	14.95	30	.40	215A/VT5	.28	715B	6.55	CK1090	2.65
1G6	.65	VT5/215A	.40	33	.70	221A	1.75	717A	.60	1148	.35
1L4	.50	5AP1	3.75	34	.33	227A	2.90	721A	2.60	1201	.45
1LC6	.75	EL-C5B	4.25	RK34/2C34	.35	231D	1.20	722A/287A	9.50	1203	.45
1LN5	.80	5BP1	2.45	35/51	.55	RX233A	1.95	723AB	14.95	1203A	.65
1P24	1.75	5BP4	3.95	35W4	.45	257A	3.00	724A	3.85	1236	1.75
1Q5GT	.85	5CP1	2.45	35Y4	.50	268A	2.95	724B	3.85	1294/1R4	.55
1R4	.55	5D21	22.50	36	.55	274B	2.65	725A	6.85	DG1295	9.95
1S5	.60	5FP7	1.75	37	.35	282B	5.25	726A	4.95	1299/3D6	.45
1T4	.65	5GP1	2.95	38	.35	287A/722A	9.50	726B	13.50	1299A	.60
2A7	.70	5H-4 BALLAST	.45	39/44	.30	304TH	3.70	730A	9.95	1613	.55
2B7	.70	5HP4	4.75	43	.5C	304TL	1.95	801	.40	1616	.75
2B22/GL559	1.75	5J23	13.00	45SPEC.7V.FIL.	.28	307A/RK75	3.60	801A	.65	1619	.35
2C22/7193	.35	5J29	13.45	46	.65	316A	.45	803	3.40	1624	1.25
2C26	.30	5U4G	.75	EF50	.45	327A	2.50	804	6.90	1625	.35
2C26A	.40	5W4	.76	50B5	.65	350B	1.85	805	5.75	1626	.35
2C34	.40	7-7-11 BALLAST	.35	50L6GT	.54	354C	14.95	808	1.65	1629	.35
2C40	5.25	7A4/XXL	.55	VT52/45SPEC.	.28	356B	4.95	809	2.65	1630	2.75
2C44	1.25	7A7	.56	56	.70	368AS/703A	3.75	811	2.35	1638	.65
2E22	1.10	7B4	.55	57	.45	371A	.80	812	2.95	1641/RK60	.65
2J21	10.45	7B8	.60	58	.50	371B	.80	813	8.95	1642	.55
2J21A	10.45	7C4/1203A	.35	RK60/1641	.65	388A	2.95	814	2.60	1852/6AC7	.90
2J22	9.65	7C5	.60	VT62 BRITISH	1.00	393A	3.60	815	2.35	1853/6AB7	.95
2J26	8.45	7C7	.60	HY65	3.25	394A	3.60	826	.75	1960	.85
2J27	12.95	7E5/1201	.60	66B4	.90	395A	4.85	830B	3.95	1961/532A	1.85
2J31	9.95	7E6	.55	VT67/30	.58	MX408U BALLAST	.30	832	6.50	1984	1.75
2J32	12.85	7F7	.60	70L7	1.05	417A	14.25	932A	7.95	2051	.75
2J33	18.95	7H7	.60	CEQ72	1.45	434A	2.85	834	5.75	UX6653	1.20
2J34	17.50	7L7	.65	CRP72	.95	446A	1.15	835/38111A	1.00	7193	.35
2J37	13.85	7Y4	.50	CYN72	1.65	446B	1.75	836	1.45	8011	2.55
2J38	9.95	9-3 BALLAST	.45	RKR72	.90	GL451	1.90	837	2.25	8012	2.75
2J48	19.95	10	.50	RKR73	1.23	GL471A	2.75	838	3.10	8013	1.25
2J61	24.50	10 ACORN	.55	76	.40	SS501	3.00	841	.40	8020	2.10
2X25/723A/B	14.95	10/VT25A	.53	77	.45	527	12.85	842	2.75	8025	6.75
2X2	.45	10E/146	1.00	78	.45	WL530	2.75	843	.40	9001	.45
2Y3G	1.20	10T1 BALLAST	.50	VR78	.65	WL531	1.75	851	39.00	9002	.40
3-16 BALLAST	.45	10Y/VT25	45	80	.45	WL532	1.65	852	6.10	9003	.45
3A4	.35	15A	3.00	FG81A	3.95	532A/1B32	1.85	860	7.55	9004	.55
3A4/47	.45	12X825 2A.TUNG	1.45	83V	.90	GL559	2.10	864	.40	9006	.30
3B7/1291	.40	13-4 BALLAST	.35	89	.42	KU610	6.90	865	1.85	38111A/835	1.00
3B22	2.35	14B6	.75	89Y	.40	HY615	.35	866A	1.30		
3B24	1.75	14Q7	.55	VR90	.95						
				VT90 BRITISH	2.55						

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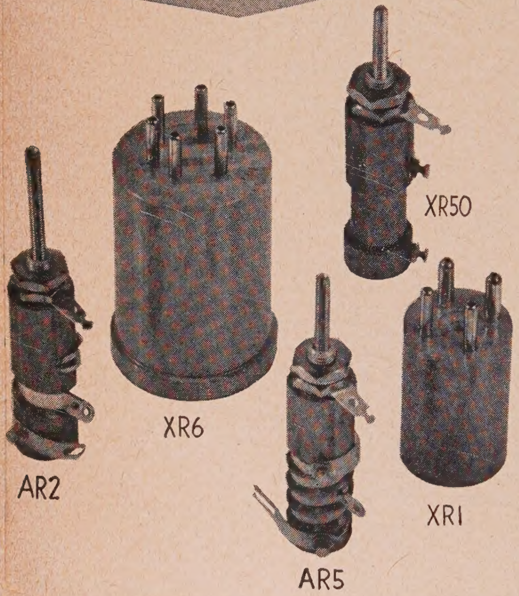

COILS and COIL FORMS

COILS. AR-2 and AR-5 h.f. coils are high-Q permeability-tuned RF coils on low-loss molded bakelite forms. AR-2 coil tunes from 75 mc. to 220 mc. with capacities from 100 to 10 mmfd. AR-5 coil tunes from 37 mc. to 110 mc. with capacities from 100 to 10 mmfd. Other windings may be substituted to modify range.

COIL FORMS. Molded of mica-filled bakelite permitting grooving and drilling. XR-50 (11/16" long, 1/2" dia. form; 1/2" long, 3/8" dia. iron slug) may be wound as desired to provide a permeability-tuned h.f. coil. XR-4 (1 1/2" long, 1" dia.) is standard four-prong form. XR-6 (2 1/4" long, 1 1/2" dia.) is six-prong form for use with special National XC-6C socket. Other types include XR-1 with four prongs, XR-2 and XR-3 without prongs.

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